RESUME

Mark C. Jorgensen
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April 24, 1974

EDUCATION

1971 to 1973

California State University, Sacramento
Bachelor of Science Degree
Environmental Resources (Park Management)
Graduated June 10, 1973

1969 to 1971

Grossmont Junior College
Associate of arts Degree
El Cajon, California
Graduated June 8, 1971

1965 to 1969

Grossmont High School
El Cajon, California
Graduated June 16, 1969

MAJOR COURSES STUDIED GPA 3.1

Mammalogy
Ecology
Vertebrate Zoology
Natural Resources Conservation
Botany
Nat. Hist. of Plants & Animals
Oceanography
Geomorphology
Climatology
Geology

Park Interpretation
Resource Protection
Park Law Enforcement
Admin,Oganz,Supv, of Camping
10 units Special Studies---
Desert Bighorn of Anza-Borrego Desert State Park.
& Feral Burros of Death Valley National Monument.

EXPERIENCE

June 4,1973 to March 4,1974

Studied desert bighorn in Anza-Borrego Desert State Park, CA. Continuance of 1972 survey. Studied population dynamics, numbers, mortality, natality, watering & food habits, human encroachment, competition with wild cattle, and distribution of bighorn. Hansen Habitat evaluation was completed for the park and water source inventory was completed for seventy springs.

Interpreted wildlife to visitors of park, patroled 80,000 acres in Fish Creek Area, maintained patrol district, camp area, and interpreted regulations in high impact recreation area

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EXPERIENCE CONT'.

January 24,1973 to February 1, 1973

Investigation of feral burros of Death Valley National Monument. Study area of app. 100,000 acres was covered by vehicle and by foot with 35 miles of hiking. Studied impact of the burro upon habitat of the Nelsons Desert Bighorn Sheep. Culminated study with 19 page report submitted to Sacramento State University for six units. Also submitted to Death Valley National Monument and the California Dept. of Fish & Game.

June 6, 1972 to September 1, 1972

Study of Penninsular Bighorn Sheep in Anza-Borrego Desert State Park. Studied distribution, population numbers, conditions, and age and sex ratios, food habits, competiion with cattle, human encroachment, spring maintenence, investigation of poaching, and interpretation to schools, clubs, conservation groups, as well as testimony at public hearings.

August 10, 1971 to August 31, 1971

Hiked length of Anza-Borrego Desert State Park, largest state park in the nation; 110 miles. Studied wildlife & plantlife, and compiled a 100 page journal.

October 1962 to Present

Actively involved in study of the desert & mountains. Herpetology, mammalogy, ornithology, and geology. Hiking Sierra Nevadas, Colorado Desert, Death Valley, Grand Canyon to study four subspecies of bighorn sheep. Have made more than 650 sightings of bighorn in four states, and have made more than 260 sightings of feral burros in a variety of life zones, and sightings of wild horses.

Have made three trips to jungles of Mexico studying reptiles, amphibians, mammals, and enjoying the ocean. Have run the Lower Colorado River on four occasions.

Member of the Desert Bighorn Sheep Council; 1973 and 1974. Have submitted papers for publication in both years to the Desert Bighorn Council Transactions.

Also have worked closely with Dr. Lynn Griner of the San Diego Zoo Hospital with necropsies of bighorn lambs, also have actively fought to remove feral cattle from Anza-Borrego, feral burros from China Lake and Death Valley(by forwarding reccomendations to the U.S. Senate) fought to prevent road from traversing vital bighorn habitat in Anza-Borrego from 1968 to present. Am working to close 15,000 acres of O. c. cremnobates habitat to off-highway vehicles on B.L.M. land in McCain Valley Conservation Area, California.

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PERSONAL DETAILS

Age: 22
Height: 6'1"
Weight: 176 pounds
Health: Excellent
Hobbies: Hiking, writing, wildlife study, conservation work, soccer, and raquetball.

REFERENCES

Richard A. Weaver
Wildlife Biologist
California Department of Fish & Game
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Maurice H. Getty
Manager
Anza-Borrego Desert State Park
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Merrel H. Taylor
Professor of Zoology
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Professor of Mammalogy
Department of Biological Sciences
California State Uneversity, Sacramento
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A FIELD SURVEY OF DESERT BIGHORN SHEEP COMPETITION IN THE WHITE AND INYO MOUNTAINS OF THE INYO NATIONAL FOREST, CALIFORNIA

MARK C. JORGENSEN

JANUARY 1975

I ABSTRACT

The author was contracted by the Inyo National Forest to study competition which was suspected to be occuring between the desert bighorn sheep (Ovis canadensis), deer(Odocoileus hemionus), wild horse(Equus caballus), feral burro (Equus asinus), and cattle(Bos taurus). Concern for the dwindling bighorn numbers in the White and Inyo Mcuntains of east-central California, brought about this study. Two and one half months were used for literature research, interviews, and field work. Interviews were conducted with more than twenty knowledgable persons, and 140 miles were hiked in the field to gain knowledge of the range and the problems facing the desert bighorn. No bighorn sightings were made, but seventeen horns were found, over one hundred beds, and fresh tracks were noted. Scat was collected for parasite analysis.

Sightings of fifty-five wild horses were made, and over eighty feral burros were observed. Competition with horses is critical on Pellesier Flats of the White Mountains. Burro competition with the bighorn is critical in Paiute and Willow Creeks of the Inyo Mountains.

Thirty-five deer were sighted during the study and as with other wildlife sightings, are described in detail in this paper.

Cattle have displaced the bighorn in many areas as described herein, and the grazing allotments of the Forest Service need reassessment.

Further indepth study is necessary to better deal with the problems of the desert bighorn.

The future of the desert bighorn of the Inyo Naticnal Forest is entirely

in the hands of the Forest Service. With data of this report, and implementation of the recommendations made within it, it is hoped the Forest Service can wisely protect this valuable desert bighorn range.

II INTRODUCTION

On June 29, 1974 an agreement was signed to contract the author to investigate suspected competition of bighorn in the White and Inyo Mountains of east-central California. The contract was made by the Inyo National Forest, White Mountain Ranger District. The study area contains the east section of the Inyo National Forest in Mono and Inyo Counties of California and Esmaralda and Mineral Counties of Nevada.

Purpose of the investigation was to gather information on past and present range of desert bighorn, wild horse, feral burro, domestic cattle, and deer. This information was interpreted to determine the degree to which the exotic ungulates compete for forage, water, and space, with the native bighorn sheep, and to make recommendations to the Forest Service in order for it to formulate a meaningful management plan for the range.

Previous studies of bighorn have been made in the White Mountains by McCullough and Schneegas(1966), and by Weaver and Mensch (1970) and in the Inyo Range by Burandt(1970) and Weaver and Mensch(1970). Investigation of wild horses in the northern White Mountains has been undertaken by Kathy Ayres of Inyo National Forest. The feral burros of the eastern Inyo Mountains have not been studied concerning their affect on the native biota of the National Forest. Competition studies had not been previously undertaken. No complete studies have been performed on the ecology of bighorn in either range.

Bighorn numbers are low and scattered in both ranges surveyed and no sightings were made by the author. Large numbers of sightings were made of horses, burros, cattle, and deer, and are included in the results of this report.

The study area has a 125 year history of encroachment by white man. Man first came to the Inyo Range in search of gold as early as the 1840's and his

heavy use of both ranges did not cease until the late 1930's (Akin,A. per com). Logging and prospecting is evidenced by ruins in the White Mountains and that man used the bighorn heavily as a food source is evidenced by sheep remains in the camps of Native Americans and in the dumps of a number of mining and logging camps.

This study was preceeded by a four day preliminary trip in early June to the southern Inyo Mountains. The majority of field work was performed between September 6, and November 12, 1974 with twenty days spent in the field in the White Mountains and eleven field days in the Inyo Range. Considerable time was used for interviews with more than twenty people in Sacramento, Owens Valley, and Saline Valley.

Recommendations are included in the appendix and were formed to give the Forest Service insight into the problems of the desert bighorn, with hopes that the Forest will move to enhance the bighorns condition within the study area. It will only be with sound management practices and some precedent setting moves by the Forest Service that a future will be assured the desert bighorn of the Inyo National Forest.

Acknowledgments are due to the many people who gave of their time to allow me to interview them or who accompanied me in the field. For their companionship on short segments of the survey, I thank Phil Benge, Anita Brosius, Mary Lukens, Murphy Maier, and Howard Matzat. For the initial incentive of this study, I thank Dave Dunaway, Dave Garber, and Dick Weaver. For their information and time I wish to give my appreciation to Kathy Ayres, Banky Curtis, Ernie DeGraff, George Erwin, Jack Hiehle, Jon Hoefer, Paul Kimsey, John Lawrence, Richard Moss, Tina Nielsen, and Doug Reid.

A special word of thanks to Alan Akin , Glen Akin, and Dan Dickman of Saline Valley whose hospitality, knowledge of the area, and awareness of the problems, gave me a new outlook on policy and ways to rectify the bighorn-burro problems in the Inyo Mountains.

Also, to Vern Burandt, who for nineteen years has fought to give the wildlife of his area a fair chance against the human race, and who possesses an uncanty awareness of the ecological relationships within the Inyo Mountains.

To Anita Brosius for her many hours of drilling information into my head, showing me slides of the Inyo and White Mountains, and for her comradeship in Falls Canyon and use of her many pages of field notes, a special thanks.

Finally, and most importantly, to Doug Powell, for his two weeks companionship, and for allowing me to pick his mind of some of his twenty-five years of experiences in the White and Inyo Mountains. I would have been at a total loss without Doug Powell .

III METHODS AND MATERIALS

Ideally, the U.S. Forest Service would back such a study with equipment for the ground work, transportation, helicopter, and fixed-wing surveys. This failing, the author expended almost $500.00 for transportation and covered more than 140 miles on foot in the study area. Approximately 90 miles were hiked in the White Mountains and more than 50 miles hiked in the Inyo Mountain Range.

Considering this as a competition study and knowing the bighorns range habits, the author concentrated efforts in fringe areas of present sheep range, where possible competition could be studied. The only time spent within a major bighorn concentration area was in early November in a tributary of Paiute Canyon in the Inyo Mountains. Most hiking was done from horse or burro concentration areas, up slope in each canyon, to present bighorn range; in this manor, getting a stratagraphic perspective of the ranges of wild horse, burros, deer, cattle, and bighorn sheep. Most hiking was done in three to five day segments.

Vegetation was evaluated closely in all areas surveyed and collected for positive identification. Plant identification was made by Reid Moran, botanist, San Diego Natural History Museum. Vegetation use was quite distinctive in the ranges of the five herbivores studied and indicative of the pressure placed on the range by them.

Sightings of horse, burro, and deer were aided with the use of 7x35 binoculars. No live bighorn sightings were made in either range. Use of the Forest Service elapse-time camera aided in surveillance of Waucoba Spring in November and logged three groups of burros watering there, one after dark.

Interviews were made with more than twenty individuals in order for the author to obtain a well rounded background of the conditions in both mountain ranges. These proved valuable for historic range data and minimized the authors orientation time of the study area.

Bighorn habitat was evaluated using a Hansen Habitat Analysis Method (Hansen 1972) and the data was included in this report to aid the Inyo National Forest in determining problem areas of the survey area.

Water sources were logged and bird sightings recorded because of the infrequency of Forest personnel into some of the remote sectors of the region, so the Forest can realize some of its lesser known resources.

IV DESCRIPTION OF HABITAT

The survey area consists of the eastern region of the Inyo National Forest; the White and Inyo Mountains, east of the Owens Valley, and west of Fish Lake and Saline Valleys. The area is approximately 95 miles long and averages eleven miles wide. Basically, the areas hiked were the east slopes of both ranges. The eastern White Mountains were studied for their resident horse populations, and the eastern Inyo Mountains studied for the feral burros which use the canyons off the desert of Saline and Cowhorn Valleys.

Bighorn range on the west slope of the northern White Mountains and until the late 1960's used the crest(Pellesier Flats), and the upper cliffs of the east slopes. In the Inyo Mountains, bighorn range the southern half extensively, ranging deep into the canyons of the eastern slope as well as the sage slopes on the crest.

Topography

Equal in ruggedness to any range in California, the White and Inyo Mountains rise abruptly as part of the basin and range province. The Owens Valley is a grabin, or falling block, as the Sierra Nevadas east side rises on its one flank, and the White Mountains west side rises off the valleys other flank(Powell). The White Range rises to 14,246 feet on White Mountain Peak and the Inyo Range to 11,123 feet at Waucoba Mountain.

The west slope of the White Mountains is steep, almost inpenetrable afoot, with 300 foot cliffs and dryfalls common in most of the canyons. The east slope has been glaciated in most of the northern canyons, such as Middle, Chiatovich, and Indian Canyons, but below 11,000 feet is relatively gentle,

with forested ridges and valleys. Pellesier Flats, approximatley eight miles long and one and one half miles wide is a level tundra plain which is the crest of the northern White Mountains. The east slope and Pellesier Flats have been abandoned by bighorn since the invasion of wild horses and domestic cattle. The refuge for the bighorn has been the rugged west slope, which is excellent bighorn habitat, with large cliffs, good forage, and year around water supplies.

The Inyo Range is very steep, with large dryfalls on the east slope and less steep, but still formidable on the west slope. The east slope drops spectacularly into Saline Valley at 2,000 feet elevation. Sheep inhabit the crest between Cerro Gordo and Paiute Canyon and the steep canyons between Daisy (Burandt) and Paiute Canyons.

Vegetation

All canyons of the east side of both ranges contain good water supplies and most are thick with ripparian vegetation such as wild rose, willow, aspen, horsetail rush, cane, star thistle, virgins bower, and grasses. Most north facing slopes, north of Paiute Canyon in the Inyo Range are thick with piñon pine(Pinus monophylla), limber pine(Pinus flexilis), quaking aspen(Populus tremuloides), bristlecone pine(Pinus aristata), and in isolated pockets, the lodgepole pine(Pinus contorta), and juniper(Juniperus sp.). Distribution in the range is dependent on elevation and lattitude. On the southern exposure grows mountain mahogany(Cercocarpus intricatus) and (Cercocarpus ledifolius), ephedra(Ephedra nevadensis) prickly pear cactus(Opuntia sp.) to 8,000 feet, and sagebrush(Artemesia sp.). The crest of the White Mountains support wind blown growths of sage, skyline bluegrass(Poa epilis), (Stipa pineatorum), redtop(Agrostis alba) and alpine gold(Husea algida).

Water

Water is common in all canyons of the eastern Inyo Mountains, is in virtually every canyon of the White Mountain Range and many springs are found along Pellesier Flats on the northern White Mountains. Snow pack remains late on the shaded slopes, and small glaciers are found in the upper cirques of Indian, Chiatovich, and Middle Creeks. There is truth in the statement that the Inyo Mountains are a desert range. This is supported by the fact that it receives less than eight inches of precipitation on much of its lower slopes, and growths of desert vegetation are supported. But, this range is relatively well watered and if a man knew the terrain, would be hardpressed to not find water, even in the summertime. The statement that the Inyo Range is a "dry range" is overemphasized by the National Forest office. Water is certainly not in such a short supply to be a limiting factor to the resident bighorn population.

Wildlife

With so many diverse ecological communities within this survey area, due to elevational and lattitudinal factors, the wildlife types are correspondingly varied. The range supports thousand pound animals such as the horse and cattle, smaller animals like the burro, the desert bighorn, mountain lion; ranging to wildlife such as the chukar, pika, desert side-blotch lizard and desert salamanders.

Bighorn levels are low in these ranges, with estimates of 40 in the White Mountains and 30 in the Inyo Mountains(Weaver and Mensch,1970). Deer populations are thrifty in the northern Inyo and in the entire White Mountain Range. Townsend hare inhabit the tundra areas above 11,500 feet as does the pika and

the yellow bellied marmot. Predators found in the ranges are the mountain lion, coyote, gray fox, bobcat, ringtail, rough legged hawk, redtailed hawk, golden eagle, and two species of rattlesnakes.

Reported sightings of what are possibly two new species of desert salamanders were received from two confidential sources while the study interviews were being conducted. This, along with sightings of an endangered bird specie are not included herein, due to over popularity of rare species, and an unconscious damage imposed by the protecting agency. It is for the welfare of the species that this information is withheld.

Human distubances in the range are described under section V, Description of Individual Areas, and section VIII, Mans Use of the Native and Exotic Ungulates.

V DESCRIPTION OF INDIVIDUAL AREAS

WHITE MOUNTAINS

Trail Canyon

Located in the northeast sector of the study area, entirely within Nevada, on the east slope of the White Mountains, Trail Canyon cuts into the range from 7,500 feet to over 11,500 feet. A jeep road winds its way to 9,100 feet in the canyon bottom. The lower slopes support healthy stands of pinon pine, with dryer slopes of mixed mountain mahogany, ephedra, prickly pear cactus to 9,500 feet, upper slopes of sage and limberpine, and the canyon bottom supporting rabbitbush (Chrysothamnus nauseosus)in the lower drainage, and wild rose, aspen, and willows above 8,500 feet.

An eight mile loop trip was hiked in mid-September, from 9,100 feet to 10,900 feet in Trail Canyon, then heading south to 11,100 feet between Dry Canyon and Middle Creek, and back down to the ridge north of Dry Canyon, into Trail Canyon at 9,100 feet.

Twenty-eight sightings of nineteen different wild horses were made in Trail Canyon in two days at elevations ranging from 9,500 feet in the mountain mahogany-lupine-sage community, to 11,200 feet on alpine tundra slopes of scattered alpine gold and bluegrass. Heavy horse trailing is found above 10,000 feet and wild horse sign is common around the springs in the canyon bottom at 9,600 feet. Deep trails lace the ridgetops and slopes at 11,000 feet and moderate use of the native grasses and herbacious annuals was found along these trail corridors. Use of ephedra, lupine(Lupinus breweri) and sage, was documented at the 10,000 foot elevation. Considerable trampling was discovered wherever brush grew in thickets, as is common is sage-lupine-ephedra situations in this canyon.

Fourteen cattle were sighted near the head of the canyon bottom at an excellent spring at 9,575 feet. The cattle take a heavy toll on the native grasses in the spring area. These cattle were to have been removed by September 1, 1974 (Reid, per com) but the rancher had not removed them as of September 19,1974. Close watch must be kept to insure these cattle are off the range by the time prescribed by the Forest Range Conservation Officer, lest further damage be caused. Damage becomes much more severe toward the end of the summer season, when grasses are in short supply due to the heavy grazing pressure. This problem of range degradation is compounded when one considers that wild horses and a high deer popualtion use the same range as the cattle. The only heavy vegetation damage in Trail Canyon was found where cattle grazed in cohabitation with the wild horse and mule deer.

Mule deer sign was found at all elevations in Trail Canyon. The deer and horse relationship grossly appears as one of nuetralism, where neither is affected by the presence of the other. Eight deer observations were made in Trail Canyon, three at 9,600 feet in the spring area and five at 10,100 feet on the limberpine slopes. Sign was found as high as 11,100 feet and trailing was especially concentrated in the limberpine forests.

No competition of horse, cattle, or deer occurs with the bighorn sheep in Trail Canyon presently, as no bighorn appear to have used this area for at least many decades. For this reason, the area should be set aside with perpetuation of the wild horse resource as a priority. This is a good opportunity for interpretation of the wild horse to the public, for people to observe and appreciate the horse as a free roaming wild animal that was native to this continent until about 9,000 years ago(Ryden,1972, George Miller,paleontgst, per com).

Three golden eagles sightings were made of what are problably two individuals in the Trail Canyon region. Three red tailed hawks(Buteo jamaicensis) were sighted, as well as thirty chukar(Alectoris graeca), Clarks nutcrackers (Nucifraga columbiana), mountain chickadees(Parus gambeli), Stellers jays (Cyanocitla stelleri) American kestrels(Falco sparverius), flickers(Colaptes cafer), and the mountain blue bird(Sialia currucoides).

Recommendations are not necessary in this canyon for eleviation of any human disturbances, as visitation is slight, and no road closures are recommended here. Close watch must be kept on the condition of the grasses and the cattle should be regulated more strictly in the future.

Dry Canyon

The road into this canyon is closed at 7,700 feet at the Red Rock Mine. Large scale mining pressure occurs in the lower end of this drainage below 8,500 feet and restricts public entry to the upper sector of the canyon.

Dry Canyon is one mile south of Trail Canyon, drains from 11,200 to 7,500 feet, and is entirely within Nevada.

Vegetation variety is identical to Trail Canyon, but the steeper canyon formation causes vegetation to be more dense. The upper slopes give rise to two springs at 10,400 and 10,480 feet. Well worn horse trails lead to these perennial water sources, but the sources remain clean and the flow unaltered by this heavy horse use. No scat was found within many yards of the water source. Impact on grasses in the spring areas is heavy. Sixteen sightings of nine individual horses were made on two different days in Dry Creek. These nine horses came into Dry Creek from Trail Canyon at 10,800 feet late in the evening for water. Horse and deer sign were found as high as the author hiked

(11,100 feet) and both were in high concentration along the south ridge of Dry Canyon, overlooking Middle Creek. Horse and deer tracks were seen in the creekbed at 9,200 feet in Dry Creek. Horse sign was not common on the steep north facing limberpine slopes, where deer sign was predominant. Horses move freely along the higher slopes and ridges above timberline tetween northern Trail Canyon and the Middle Fork of Middle Creek.

One deer was observed on the high ridge at 10,800 feet between the Dry and Trail drainages.

No cattle were observed, but old sign was found in the creek at 9,200 feet. Because of the lack of human encroachment above 8,500 feet and the density of the vegetation, giving this canyon a certain integrity, cattle should not be allowed to graze in Dry Canyon.

The upper headwalls of Dry Creek are the shoulders of Boundary Peak, Nevadas highest mountain. These steep, rocky slopes could have supported bighorn sheep at one time, but no beds, scat, or horn sheaths were found. Kathy Ayres of the White Mountain Ranger District discovered the the horn sheaths and cores of a ram in upper Dry Creek on July 25, 1973 on a ridgetop, two to three miles east of Boundary Peak. These were very old but, the presence of the bone cores could mean they were relatively redent, perhaps within ten to twenty-five years. The bone normally breaks down rapidly due to extreme temperatures and heavy snowfall. Forage exists in the area, even though it is stunted by high winds, and water is available, as is good escape terrain. Bighorn could survive in this area quite easily, but the grasses are reduced by the horse on the upper slopes,most likely precluding the bighorn retainment of this region as home range. Since the horses have been in this upper area for

some ten years(Ayres, Powell, Reid), the bighorn probably faced a compound problem at the time of the horses establishment. If bighorn population numbers were on a low cycle at the time, or this area was used only occasionally, the horse could have displaced the bighorn rapidly and easily. The horse could have displaced even a well established sheep population, but probably at a slower rate.

The slopes of upper Dry Creek and Boundary Peak were glassed for hours with no observations of bighorn made.

Birds sighted here include the golden eagle, red tailed hawk, mountain c chickadee, mountain blue bird, and Clarks nutcracker.

Montgomery Peak, California to Boundary Peak, Nevada

This 13,000 foot region is very rugged, characterized by narrow ridges and steep slopes, marked with outcroppings of granitic cliffs. Small bunches of blue grass, Stipa, and alpine gold are found on the lee-side of the rock faces. No free water is found in springs or seeps. Snow persists in some shaded cliff areas on the north slope. Weaver(1970) names Montgomery Peak as a bighorn summer range, and many references were made to this region during the course of interviews with Jon Hoefer and Doug Powell. In the Inyo National Forest files are sightings near Montgomery Peak in 1966 of thirteen bighorn, in April 1970 of one ram($2\frac{1}{2}$ miles west of the peak) and in February 1974($\frac{1}{4}$ mile north of the peak) of a single ram.

Further study of this area is certainly necessary to determine present status of bighorn sheep. See B in Appendix III for recommendations.

Feral horses have not penetrated this rugged part of the range as yet, but if pressured by an increase in population, could encroach on the steep barren slopes to over 12,000 feet.

Middle Creek

Bounded by Dry Creek Canyon, two miles to the north, and on the south by North Fork Chiatovich Creek, this six mile long canyon rises from 7,100 to 13,500 feet. The headwalls are broad morrainal valleys which rise abruptly into steep cliffs and peak out at well over 13,000 feet on northern Pellesier Flats. The headwaters are three major forks which hold at least five springs. The canyon area below 11,000 feet is well forested by limberpine and pinons. The south facing slopes hold thick expanses of mountain mahogany and sage. The vegetation on the slopes and in the creekbed is identical to that described for Trail Canyon.

A twelve mile hike was made in this drainage covering the valley floor, up the middle fork, south to 12,400 feet and then along the south ridge overlooking North Fork Chiatovich Creek, to 9,605 feet, and dropping off the ridge, north into Middle Creek at 8,160 feet.

Horse sign was found at a major crossing at 7,550 feet between Black Mountain and the north ridge. Horse and cattle sign was common in the lower canyon, cattle sign becoming dominant between 8,400 and 9,000 feet. Horses use the north fork springs, as evidenced by heavy trailing from Dry Creek, but do not use the two springs on the state line at 10,000 feet, or the upper sector of the middle fork. Horse sign is heavy in the south fork and along the entire south ridge from 11,600 to 9,600 feet. Two skeletons were found on the south ridge, one at 11,350 feet and the second at 10,700 feet. No horse sightings were made, but fresh sign was heavy and use of the grasses and shrubs was moderate to heavy. Excellent grasses are found on the steep slopes of the middle fork between 10,000 and 11,500 feet. These grasses grow to about one foot in

heigth. Four old horse scat piles were found in this site but the area has been used only rarely by the horse. The large glacial moraine in the middle fork seems to be a boundary of horse range, as sign is common and becomes heavy on the mesas to the south. A small playa at 11,000 feet holds a seep, and sign of horse and deer in the area is very heavy.

As stated, between 8,440 and 9,000 feet in the canyon bottom, cattle sign is predominant. Horse and deer evidence was nearly non-existant in this region. The impact of the cattle upon the vegetation seemed to displace the other large herbivores, which was unique to this area. Cattle and horses often do not use the same range, prefering to use separate territories(Ayres,per com). But this one area was unique in that the deer too, appeared to have been displaced by the presence of cattle. Six cattle were sighted at 8,350 feet, again, three weeks after they were to be off the range in accordance with the National Forest grazing permit. Sign persisted to 9,6000 feet, deep into the Cercocarpus slopes. The aesthetic appeal of the creek in this canyon has been degraded considerably by the presence of cattle. A one acre flat at 9,000 feet was found to be trampled heavily by cattle and feeding was documented on rabbitbush, grasses, and sage. Lupine was heavily trampled.

Deer sign was common in all sections of Middle Creek, except for the void described above, where cattle displace the deer and horse. Deer sign was found as high as 12,400 feet in the middle fork, at all water sources, and along the entire south ridge. A doe and large fawn were sighted in a aspen thicket at 8,3000 feet. Heavy use was found at the southern spring on the state line. Heavy sign was found in the middle fork on a flat at 9,750 feet.

No bighorn or fresh sheep signs were found in Middle Creek, but what appeared to be four bighorn beds were found at 12,480 feet on a very steep rocky ridge. These beds were at least two to five years old, with no scat present.

This site is two-thirds of a mile northeast of The Jumpoff. At 10,000 feet, at a spring, 100 yards within the State of California, was discovered an encampment used by the Native Americans. A chert arrowhead and scraper were found on the site. Among the cones and needles, beneath the limberpine and bristlecone pines, were discovered fifteen horn sheaths of bighorn sheep. These sheaths were all from rams, and represented at least nine individuals. The ridge above this site was undoubtedly spring and summer range of the bighorn and the Native Americans capatalized on them as a food source. A four inch section of pelvic bone and a cervical vertebrae were found among the needles and when taken to the Los Angeles County Museum were identified as Ovis cana densis.

Much of the upper range in Middle Creek is still ideal potential spring and summer range for the bighorn sheep. Sheep do not use this range presently, possibly due to their displacement from Pellesier Flats by the horse and a complex of problems stemming from disease, human encroachment of Pellesier, or both. Bighorn could be successfully reestablished in this range by removing the horses from the south fork of Middle Creek as well as removal of the two to four horses which range on Pellesier Flats.(See recommendation A(5) in Appendix III). Then,if the sheep numbers increased significantly in the range, they would easily reestablish this area as home range with a decade.

Bird sightings in Middle Creek included a golden eagle, six blue grouse (Dendragapus obscurus), at the spring on the State line, Clarks nutcracker, chukar, red tailed hawk, mountain blue bird, and the Oregon junco(Junco oreganus).

Chiatovich Creek

This nine mile long canyon contains at least eighteen square miles of varied terrain. The glaciated crags of the headwalls contrast with the lowland marshy pastures and the dense aspen groves of the mid-elevations. The headwalls are 13,500 feet, the mouth of the canyon is 6,800 feet, making this the most varied of the east side canyons relative to elevation and vegetation.

Fifteen miles was covered by foot within this canyon, ranging the North and Soth Forks thoroughly, collecting data on horse, cattle, deer, bighorn sheep, golden eagles, and the floral types. Six major springs were found and two creeks wind their ways through rose thickets and aspen groves, to eventually flow into the Nevada desert in Fish Lake Valley. Animal use of this area is heavy and in all areas was found dense sign of one or more types, including large numbers of horse, cattle, and deer.

Horse range within Chiatovich Creek varies as much as the elevation. No sign was found below 9,100 feet in the South Fork and 8,700 feet in the North Fork, this being dictated by the presence of springs. Horse sign in the South Fork is heaviest at 9,200 feet in the spring area, with moderate trailing from Davis Creek. Moderate sign in this fork was found to 11,700 feet and was not as heavy as that found in the northern fork. Fresh sign was found but no sightings made in South Fork Chiatovich Creek. The lofty ridge between South and North Forks Chiatovich Creek was found to have heavy trailing and fresh sign along its entire crest. Horse trails and scat piles were found as high as 12,200 feet on this ridge, and it is thought by the author that this route is used for access to the crest, Pellesier Flats. Heavy trailing was found at 11,800 feet which connected the ridge with the upper areas of North Fork Chiatovich Creek. Extreme vegetation cropping was documented on the ridge, with heavy damage to alpine gold and two species of grasses. Damage to the grasses

in the small corridors along the crest was so extensive, that decent samples could not be collected to identify them. This area is hardest hit by horses of any range surveyed in the White Mountain Range, primarily due to the naturally scant vegetation cover. So,relative to other areas such as Trail Canyon, impact is extreme in upper Chiatovich Creek.

Twenty horses were sighted in North Fork Chiatovich Creek, ten on the north slope at 11,800 feet, and ten on a mesa in the canyon bottom at 9,600 feet. The band at 11,800 feet was grazing one and three-quarter miles southeast of The Jumpoff, on sparsely grassed rocky slopes. Heavy trailing was observed on this hillside, leading to the springs at the 10,200 foot level on the valley floor. Constant heavy sign was found in the canyon bottom in the North Fork to the 8,700 foot level in a spring site. At this spring site were heavy trails of horse and cattle, large dust beds, and large scat piles of horse and cattle. Damage is compounded in this area by the simoultaneous use by these two large herbivores. See Appendix III for recommendations on removal of the wild horses from this canyon.

Cattle sign is scattered throughout Chiatovich Creek from Fish Lake Valley below 5,000 feet, to 11,800 feet in South Fork Chiatovich Creek. Fresh sign was heavy in the lower valley about the marshy pastures around 7,000 to 7,500 feet. The fence near the mouth of Davis Creek blocks the cattle seasonally, and in late September, sign above the fence was generally less than below it. South Fork Chiatovich contained cattle sign around all springs, but was not in large quantities in any one area there. A carcass of the year was found next to the spring at 11,000 feet. Bones were found at 11,800 feet, high in the glacial valley of South Fork Chiatovich Creek. Grasses were locally reduced

in all spring sites in the South Fork. As described, damage at the spring in the North Fork at 8,700 feet was heavy.

Deer are found in range not used commonly by cattle. Below the Davis Creek fence deer sign was not to be found, but above the fence, sign became generally moderate, and locally heavy. The aspen groves and Cercocarpus thickets in the valley hold many deer. Little vegetation damage was observed in range inhabited only by the deer.

The skull of a half grown fawn was found at 12,080 feet in the South Fork Chiatovich Dreek, but so fresh sign was found above 11,750 feet tn that fork. Two bucks and two does were sighted on Pellesier Flats, on the rim above South Fork, and no doubt range in the high rimrock of the headwalls. Three does were sighted on the ridge dividing North and South Forks at 11,650 feet. Sign was common there to 12,200 feet. A doe and fawn were sighted in the North Fork at a spring at 9,000 feet.

Chiatovich Creek is mentioned commonly in discussions concerning bighorn sheep in the White Mountains. On September 1, 1971, Dave Dunaway, Jon Hoefer, and Hal Hunter sighted a half-curl ram on Pellesier Flats, which ran into the Chiatovich Creek drainage. From data collected on this survey, this author concludes contemperary bighorn use does not occur in any sector of Chiatovich Creek. On the south slope high in the South Fork were found six beds of bighorn sheep which were estimated to be two to five years old. These are located at 12,350 feet on the north facing slope. A single bighorn track was found in dry hardpan above North Fork at 13,400 feet. It had been made during mid-summer after a rain, probably by a wandering bighorn from Queen Dicks or Marble Canyons. Bighorn beds were found above the dividing ridge; two at 12,900 feet and four

at 12,100 feet. These were also more than two to three years old. A pair of horn sheaths and the bone cores were found at 12,480 feet on the north facing slope of the ridge between North and South Fork Chiatovich Creek. The sheaths were from a six to eight year old ram, and had laid there quite a few years, as the bone was badly eroded. The author estimated at the time the sheep had been dead at least ten years. No other sign was found in Chiatovich Creek and no sightings were made of bighorn sheep.

This canyon area is best suited for bighorn to reoccupy, of any of the east side canyons in the White Mountains. The terrain is ideal, vegetation below 12,600 feet is very excellent along the dividing ridge and in the northern part of the South Fork, and human disturbances do not exist--save for man's introduction of cattle and horses. Bighorn could very easily reoccupy Chiatovich Creek if the recommendations in Appendix III are implemented. This calls for immediate removal of the two to four horses which range seasonally on Pellesier Flats, and the movement of all of the horses from the Chiatovich drainage to Glass Mountain or the Nevada Desert by helicoter or truck. Also if cattle are restricted from grazing in upper South Fork as well as upper Davis Creek and southern Pellesier Flats, the bighorn would move back across Pellesier Flats to upper Chiatovich Creek and regain use of this important habitat. To remove the horses without restricting the cattle grazing would be of no benefit to the bighorn sheep. The lack of administrative control of the cattle will negate any moves made to manage the wild horse. Therefore it is the authors recommendation that the National Forest gain control of both animals--restricting cattle use and removing the horses as prescribed in Appendix III.

Other wildlife sightings in Chiatovich Creek include five sightings of two or three individual golden eagles, two red-tailed hawks, coyote, pika, townsend hare, Clarks nutcracker, rufous crowned sparrow(Aimophila ruficeps), chukar, Stellers jay, and scrub jay(Aphelocoma coerulescens).

Davis Creek

One mile southeast of the South Fork Chiatovich Creek, this five and a half mile long canyon is geographically very much like Chiatovich Creek Canyon. Only the upper canyon was surveyed afoot, the middle elevations were checked through binoculars and the mouth was passed up on the hike up Chiatovich Creek. Two water sources were found in the north tributary. One is drip water from a glacier, the other is a quarter mile down-canyon. The two springs marked on the topographical map(Benton Quad) were found to be dry, as the summer of 1974 was unusually dry compared to years past(Powell, per com).

Sign of horses was found at 9,200 feet on the saddle between Davis and South Fork Chiatovich. This sign was deep trailing heading to the spring in Chiatovich Creek. Trailing was sighted on the south slopes in Davis Creek at 11,300 feet. These trails lead to a col which eventually gives way to southern Pellesier Flats. This, as well as the North Fork Chiatovich Creek provide access to the delicate flats. Two scat piles were found on the mesa between upper Davis and upper South Fork Chiatovich Creeks. These horses within Davis Creek should be transplanted in the same program as the Chiatovich and Middle Creek horses.

Cattle sign was found at the dry spring at 12,380 feet in South Fork Davis Creek. Restrictions should be implemented to keep the cattle from entering this area.

No deer sign or evidence of bighorn sheep was found in upper Davis Creek. This was definitely bighorn range in the past. The terrain is ideal, water and forage are available, and no human encroachment occurs. A single horn was found here in 1963 according to U.S.Forest Service records.

As with Chiatovich Creek, upper Davis Creek could be reoccupied by bighorn if competition for vegetation and space with the cattle and horses was eleviated.

Indian Creek

A very steep glacial canyon, just south of Davis Creek, this area is potential bighorn habitat, but is becoming heavily used by deer hunters in autumn. No sign of horse or bighorn was found in Indian Creek Canyon, but a report of horses being sighted at the 9,000 foot level in 1970 were received from a deer hunter, Ron Palmer. Five cattle were found in the North Fork of this canyon, again, beyond the annual termination date. Cattle sign was found to be heavy in the South Fork at the spring at 10,100 feet and all along an old wagon trail to Chiatovich Flats at 11,000 feet.

Deer sign was scant in the cattle area in the South Fork, but common on the talus slopes of the North Fork.

The heavy influx of deer hunters no doubt caused the lack of deer sightings and fresh tracks. Seventeen vehicles were present in the upper canyon on opening day of deer season, and three more entered Chiatovich and Pellesier Flats from the wagon trail in South Fork Indian Creek. This trail should be closed to all but horse and foot traffic. (See A (2) in Appendix III).

No modern day sightings have been made of bighorn here, and the records are confusing, as Pellesier Creek, a present bighorn concentration area, also was at one time, called Indian Creek. The records show four rams sighted in Indian Creek;but the two canyons are separated by two miles of Pellesier Flats.

To reestablish bighorn in this range, the Forest would have to implement drastic measures to eliminate all cattle from Chiatovich Flats, and this is not a realistic management recommendation. The high number of deer hunters in such a small area would also preclude reestablishment of the bighorn in Indian Creek Canyon.

Chiatovich Flats--Cabin Creek--Leidy Creek

Chiatovich Flats is an eight square mile rolling subalpine area of sage, lupine, rabbitbush, and Stipa pineatorum. The Flats are cut by Cabin Creek which contains pockets of lodgepole pine, bristlecone, and willow. The steep headwalls of Leidy Creek from the Flats' southern boundary, and rise abruptly to more than 12,600 feet. The majority of Chiatovich Flats is between 10,000 and 12,000 feet. No sign of wild horse or bighorn sheep was found in this sector described and the only suitable areas for bighorn sheep here are in Leidy Creek and upper Birch Creek. Sightings of sheep were made in Leidy Creek by Jack Hiehle of California Department of Parks and Recreation in 1963 and 1964, of one ram and nine unidentified sheep respectively. On October 23, 1958 Doug Powell sighted twenty-two bighorn sheep in Leidy Creek, between 12,000 and 13,000 feet. A single horn was found in 1954 by Gerde and another again in 1958 by Hiehle.

Deer sign was light between Indian Creek and Cabin Creek , but was common on the north rim of Leidy Creek. Thirteen deer were sighted on western Chiatovich Flats near upper Birch Creek. These consisted of four bucks, eight does, and a single fawn. Two single does were sighted in a lodgepole grove in upper Cabin Creek and in the middle of the Flats.

Cattle sign was very heavy in this region, making this the hardest hit range surveyed in the White Mountains. Cattle use was documented for sage, rabbitbush, Stipa pineatorum, lupine, and unidentified grasses. Grasses overall were reduced eighty per cent and rabbitbush was reduced forty to sixty per cent. Some lupine was untouched while others were seventy-five per cent reduced. Damage to grasses were the main impression in this region, they were severely taken down, and worse overall than most grasses in horse range. As appeared in the field notes, "Horses reduce in pockets it appears, cattle mow it all down". Heavy cattle abuse was documented in Cabin Creek, where damage appears on the riparian vegetation such as the willow and grasses. Sage on the nearby slopes is used extensively by cattle. Good water flow was present in Cabin Creek, but the water quality was degraded in the upper area by the presence of cattle feces in the stream course. Cattle grazing should be restricted to eastern Chiatovich Flats, and should prohibited in any part of Birch Creek, including the springs on the southwest rim of Indian Creek. This act would be for the sake of bighorn sheep, which could easily reestablish in upper Birch and upper Leidy Creek if the correct steps were taken to prohibit cattle grazing in those sectors. Birch Creek will be described in detail later in this section.

Thirty sage grouse were sighted in Chiatovich Flats and deer hunters took six illegally on September 27, 1974.

West Slope of White Mountains

Montgomery Creek South to Milner Creek

As previously mentioned, this west side was not studied in depth, as the survey was concentrated on competition, and no exotic herbivores inhabit the canyons of the west slope as yet, except for cattle in upper Birch Creek. The upper rims of Montgomery, Marble, Queen Dicks, and Rock Creeks, as well as Falls Canyon, Pellesier, Middle, Birch, Willow, and Cottonwood Creeks were hiked thoroughly and much sign of bighorn was discovered. Falls Canyon was hiked thoroughly between Hammil Valley and 9,000 feet. Lone Tree, Jeffrey Mine, and Milner Creeks were not hiked but historic and present day sightings are described here. All the canyons hiked were glassed extensively and good potential winter range is present in all these canyons.

The west slope is the bighorns last retreat in the White Mountain Range and protection of this habitat is essential. If wild horses are allowed to further encroach westward over Pellesier Flats, even this retreat will be seriously threatened. The deep precipitous walls of the canyons are inpenetrable by horses, but the upper slopes, which are bighorn summer range, are ideal habitat for the horse. (See recommendation A(6) in Appendix III.)

The west side of the White Mountains is more rugged than the east side already described, and is better bighorn habitat overall. Water is found in every canyon, good grasses and forbes prevail on most slopes, and good protection for bighorn is present in the form of high cliffs and steep slopes. Good winter habitat is present in all canyons studied, generally on the south facing exposures below 10,000 feet. Because of the steep nature of the west slope, the albido is high even in winter, and snow does not last long (Powell), making it available for wintering by bighorn and deer.

Vegetation of the west side is surprisingly similar to that of the east side, with stands of pinon, some bristlecone, and limberpine on the upper slopes, rabbitbush and wild rose in the creek bottoms, and mountain mahogany on the majority of the southern exposures.

Deer sign was not as common on the upper rims of the west side as was the case on the east slope. This area was inhabited mostly by the bighorn. The hike into Falls Canyon showed deer used the region below 9,000 feet moderately, and winter below 7,000 feet all the way down to the valley floor. Reports of various ranchers support this fact, the deer being common visitors to the ranches in Hammil Valley during the winter months. Deer summer in the mid elevations and some use Pellesier Flats heavily between Mt. 13,559 and The Jumpoff. Moderate to heavy deer sign was found in this tundra region in mid-September, and only four bighorn beds were found here, three on the west side of The Jumpoff, the other in upper Marble Creek.

Horse sign was found in some of the upper areas and is described in this section under "Pellesier Flats".

Cattle sign is heavy in Birch Creek in both forks, and causes a complete lack of bighorn sign in the upper canyon. Grasses were reduced fifty per cent in South Fork Birch Creek by cattle use. Sign was heavy between 10,750 feet and 12,000 feet in Birch Creek and moderate to 12,4000 feet on Mt. Hogue. Even light use(low numbers of cattle) in this tundra area causes heavy impact on the delicate vegetation and ground cover.

Bighorn sheep are described by Schneegas(1964) as wintering between Marble and Rock Creeks and between Willow and Milner Creeks. Weaver and Mensch(1970) state that sheep winter in Lone Tree, Cottonwood, Willow, and Montgomery Canyons, and that additional wintering may take place in Birch and Milner Creeks. Summer ranges of Schneegas are Pellesier Flats above Rock, Falls and Marble Creek,

White Mountain Peak, and the areas above Willow to Milner Creeks. Weaver shows summer range as White Mountain Peak, Pellesier, Chiatovich, and Perry Aiken Flats, and Montgomery Peak.

According to data collected by the author in the field in September and October, 1974, bighorn no longer summer on Pellesier Flats or Chiatovich Flats, and Perry Aiken Flats is scheduled to receive a heavier cattle grazing allotment in 1975 according to Reid(per com). Good wintering possibilities occur on a burn area at 9,600 feet in Marble Creek. Other areas must be hiked, and time was not allotted for the west side during this survey. Further study is necessary to determine population numbers and distributions, as well as seasonal ranges.(See recommendations B in Appendix III). (See Appendix I for a list of historical and present day sightings for the study area.)

Bighorn sign found during the survey in the area from Montgomery Creek to Milner Creek varied from old tracks to day old ones, beds of all ages, trailing on the steep slopes, and scat.

No sheep sign was found in Falls Canyon below 9,000 feet. The four beds mentioned were found above Marble Creek, but these were not fresh. No sign was found in Upper Montgomery Creek,but sightings in the canyon are common in the records(See Appendix I). Two bighorn pellet groups were found at 13,200 feet above Queen Dicks Canyon, but no beds or definite tracks were sighted there. Few grasses were found on a rocky spur hiked by the author between Queen Dicks and Rock Creeks.

No definite tracks or scat of bighorn were found above Rock Creek, but trailing of what appeared to bighorn sheep was found there at 12,800 feet.

Moving south, bighorn sign was heavy in upper Pellesier Creek, where

cattle and horse sign was nonexistent. Thirty sheep beds were discovered on the northwest facing slope at 11,600 to 12,000 feet. Twenty-eight more were found on the south slope of the same ridge, overlooking Middle Creek, This ridge is the west shoulder of Mount Hogue(12,751 feet).

Two possible old beds were found at 12,400 feet on the north ridge of Birch Creek, one mile south of Mt. Hogue. No other bighorn sign was found in the entire upper Birch Creek area. This later proved to be a void in the bighorn range when beds were found in Willow Creek and Cottonwood Creek. Presence of cattle in Birch Creek is no doubt the explanation for this void in the sheep range.

Two old beds were found on Headley Peak(12, 676 feet) and fifteen fresh ones found on Willow Creeks south ridge at 11,600 feet. Above Cottonwood Creek between 12,000 and 12,5000 feet were found thirty-eight bighorn beds and trailing was sighted at 11,600 feet. Good forage was noted at 11,200 feet in Cottonwoods north branch. Forage was not as good quality higher, where beds were found so quite a bit of elevational movement occurs during a days activity for the bighorn.

Two bones of cattle were found above 12,000 feet on the ridge above Cottonwood Canyon.

Birds of the west slope are Clarks Nutcracker, chukar, golden eagle, green winged towhee(Chlorura chlorura), rufous sided twohee(Pipilo erythrophthalmus), dipper(Cinclus mixicanus), cañon wren(Catherpes mexicanus), raven(Corvus corax), white-throated swift(Aeronautes saxatalis), mountain chickadee, Stellers jay, and the red shafted flicker.

Pellesier Flats

This tundra plain is all that remains of an ancient rolling flat which existed before the White Mountain Range began its dramatic uplift(Powell). The eight mile long crestline is on a northwest-southeast orientation between 12,000 feet and 13,559 feet elevation. Vegetative types and their size are limited by the extremely low winter temperatures and almost constant winds. Frigid forty mile per hour winds were encountered in mid-September. Most plants are low wind-blown sages or grasses, usually under eight inches in heighth. Large expanses are virtually denude of plantlife, covered by a delicate matrix of small stones, some arranged by solifluction.

More than twenty miles were traveled on Pellesier Flats, and a large quantity of notes were make on animal sign, sightings, and establishing range limits of the wild horse, cattle, deer, and the bighorn sheep. Sign of the coyote, marmot, pika, and chukar was common on the rocky prominances of Pellesier. Golden eagles were sighted every day, as were meadowlarks(Sturnella neglecta), gray headed juncos(Junco caniceps), rufous crowned sparrows(Aimophila ruficeps) and Townsends hare.

According to the many sources interviewed, the wild horse is a newcomer to Pellesier Flats, having established itself here only in the last ten years. Kathy Ayres, who studies the wild horse for Inyo National Forest has interviewed local ranchers, geographers, and biologists for more than two years and concurs with the ten year estimate. Ayres states that two to four horse normally range on Pellesier Flats during the spring-fall season. It is accepted by all biologists interviewed that the arrival of the horse to Pellesier Flats has meant the decline of bighorn use of that area. The records of sightings in the appendix I also support this, and show that no significant sightings of bighorn have been made on the Flats since 1969. A lone ram was sighted by Dunaway, Hoefer,

and Hunter of Inyo National Forest on September 2, 1970 on the eastern rim of Pellesier Flats, but a close check of the area in September 1974 uncovered no bighorn beds, horns, or tracks whatsoever.

The horses range freely onto Pellesier Flats from Chiatovich Creek and Davis Creek, and once on the Flats, have the feedom to roam the length of it. Sign of horses was found widely, and shows that use is intense in some areas, namely above Davis and Chiatovich Creeks and in the depression running northwest to just above Queen Dicks Canyon, southwest of Mount 13,559. Scat and a hoof were found between Rock Creek and Falls Canyon at 13,300 feet. Scat was found as far north as one and a quarter miles south of The Jumpoff at 13,360 feet. Use of Deschampsia caespitosa above Davis Creek was heavy in a dry spring site. Stipa pineatorum was grazed extensively in all areas associated with horse sign.

It is the conclusion of this study that the horses of Pellesier Flats are in direct competition for grass and space with the native bighorn. Bighorn crossed the Flats to use upper Chiatovich Creek prior to the encroachment of the wild horses and used the rocky promintories on the Flats as diurnal bedding grounds and feeding areas. A very few old beds are still found, but are all but obliterated by time. This displacement of bighorn is the most graphic of all in the White Mountains and should be taken as an illustration of what will take place in the futre on the west slope, if recommendations A(1,6) in Appendix III are not implemented immediately.

Cattle sign is found as far north as Davis Creek. Sign above Indian Creek is very heavy, and no physical barriers are present to halt encroachment of cattle onto Pellesier Flats proper. Extensive use in the area of seeps, where grasses are readily available was found to occur. Many deep trails are found

in upper Birch near Mt. Hogue to Indian Creek. These delicate plains and small water courses should be protected by prohibiting cattle grazing on any portion of Pellesier Flats. If restrictions were placed on grazing to keep the cattle off western Chiatovich Flats, the problem of cattle impact would be solved for Pellesier Flats and Birch Creek as well.

Deer sign was found scattered on Pellesier Flats, and as mentioned previously, was concentrated between Mt. 13,559 and The Jumpoff. Sign of mule deer was light south of Mt 13,559. The deer moved to winter range in mid-October, as Pellesier Flats becomes extremely harsh with the first snows. Sightings of four deer were made soutn of Mt. 13,477 in September. Fresh sign was common on the rocky slopes of Mt. 13,559. Deer most likely are filling the niche vacated by the bighorn during the last ten to fifteen years on Pellesier Flats. Deer are known to invade areas lost by bighorn, and with little competition for them, can successfully fill the niche. With no bighorn use presently, even seasonally, the deer numbers have no doubt risen accordingly.

Pellesier Flats should be designated as a Zoological Area by the Inyo National Forest to preserve its high quality and its wild integrity. This status would protect it from its present abuse by vehicles, including airplanes which land there infrequently on a makeshift strip, and by grazing of cattle.

Tres Plumas Meadow and Flat

Upper McAfee, Toler, and Cottonwood Creeks

A thirteen mile hike into the Tres Plumas area led to evidence that bighorn once inhabited the region but were forced out by wild horses and cattle, which presently use the entire area. The area was surveyed thoroughly between 12,100

feet and 10,400 feet.

Horses observed were using Tres Plumas Meadow, Tres Plumas Flat, and the sage-scrub saddles three miles northwest of the Flat, at 11,000 feet. Fifteen sightings of eight different horses were logged in the three days spent studying the area. The highest elevation horse sign was found at 12,050 feet, one mile east of the Barcroft Laboratory. Use was light there, but impact on the vegetation was moderate because of the delicacy of vegetation at such elevations. Horse sign was found all along the northern and eastern margins of Tress Plumas, overlooking McAfee, Toler, and Iron Creeks. Tres Plumas Flat is a stronghold for the wild horse and should be protected as such by the Forest Service(See recommendations in Appendix III). Horse use is moderate in the Meadow and Flat area, but gives way to cattle use on the west half of Tres Plumas Meadow and in upper Cottonwood Creek.

Cattle sign was found in all areas hiked at varying degrees, with concentrations west of Tres Plumas Meadow. Considerable impact was noted about the springs in the Meadow, to the degree that irrepairable damage has probably been done to certain species of grasses. Cattle sign was found on the Bristlecone Road to Mt. Barcroft.

Fresh deer sign was scant, as late October was cold and snowy, and all deer had move to the lower winter ranges. Old sign, a month old or more, was common above 10,500 feet.

Bighorn inhabited this region, perhaps as recently as fifteen years. The skull of one ram was found on this study. The skull was found on a saddle between the north fork of Cottonwood and the south fork of McAfee at 12,000 feet. All the upper slopes of South Fork McAfee, Toler, and Iron Creeks were surveyed, with no other skulls, horns, scat or beds being discovered. Terrain and vege-

tation are suitable, but the presence of cattle, mining, and wild horses precludes the bighorns habitation in Tres Plumas.

It is the authors recommendation to preserve the area for perpetuation of the wild horse, as the eastern sector in Tres Plumas Flat possesses an aethestically rich atmosphere. The roads into the area from the west, should be closed. Cattle numbers, or length of their grazing, should be restricted. Reintroduction or the possibility that sheep will reestablish themselves here are not likely to occur, as horses, cattle, and man are well established in the western Tres Plumas area.

White Mountain Peak

Sightings of bighorn in this area in past years are mumerous, but have decreased since human activity acelerated in 1953(Powell). The sheep using White Mountain Peak are probably summer ranging animals from Lone Tree and Cottonwood(Westside) Canyons. No reports of horses, cattle, or deer were received for the peak. Deer are said to range to over 12,000 feet in the area.

As the survey was primarily concerned with competition, the White Mountain Peak region was not hiked. Six bighorn were sighted there in Spring 1974 (Reid,per com).

INYO MOUNTAINS

Marble Canyon to Squaw Flat

An eight mile trip into Marble Canyon brought out little evidence of consequence to the survey. Water could not be found in the area, and interviews with DeGraff, Brosius, and Burandt, confirmed that no free water exists in Squaw Flat or Marble Canyon. The lack of water is a prime factor in the areas non-use by bighorn, deer, and feral burro. Terrain and vegetation could support bighorn and deer, but sign was found of neither. The feral burro range sporatically throughout the ruins of the mines at 6,000 feet, but no sign of burro was found above 6,800 feet in the bottom of Marble Canyon.

Tracks of a mountain lion were found on the dirt road, southwest of the Narrows, only 100 feet from an abandoned shack. The cat probably ranges about Squaw Peak, Waucoba Mountain, and Andrews Mountain.

If water were prospected in upper Marble Canyon or northern Squaw Flat, the deer would no doubt expand range to take advantage.

Cattle are reported to have grazed Squaw Flat in past years, but no sign is found in the northeast Flat region.

Waucoba Canyon--Waucoba Spring

Waucoba Canyon rises from 6,000 feet to 10,686 feet. The lower canyon is gentle, while the upper 2,000 feet rises abrubtly. Limberpine covers the upper slopes, with heavy growth of pinon and mountain mahogony on slopes between 6,000 and 9,5000 feet. The spring is a dripping tank affair with a horizontal pipe into the hillside. Heavy use by burro and modest deer use was noted here. The elapse-time camera was set for thiry hours at Waucoba Spring, recording use by three groups of burros totalling approximatley twenty, with one group of a half dozen visiting after dusk.

Thirty -four burro sightings were logged in the Waucoba area of at least two dozen individuals. Only four small bunches of grass(4" x 6") were found within one half mile of the spring site. Rabbitbush, sage, and Atriplex are reduced significantly by feral burro in lower Waucoba Canyon and in the spring area, while grasses are non existant as described above.

Burro sign is constant to 8,500 feet in Waucoba Canyon, where the canyon narrows and a forty foot dryfall halts any further encroachment. The riparian vegetation is severely reduced below 8,000 feet, by both burro and mule deer. The skeleton of an adult burro was found in the creekbed at 6,700 feet. No bighorn or cattle sign is present in this area. Some of the high south facing slopes above 9,000 feet would be potential sheep areas, but for the most part, Waucoba Canyon is not potential bighorn range because of the dense vegetation, and high deer and burro numbers.

Waucoba Spring should be considered as one of the most important burro watering sources in the Saline Valley area in any preservation or management plan that may be implemented by the Forest or the Bureau of Land Management. The spring is under jurisdiction of BLM but the canyon is under control of the Inyo National Forest.

Lead Canyon

Fifteen miles were covered in a loop trip from the Lead Canyon fan to 8,550 feet on the south ridge of Lead Canyon into the north fork of Paiute Canyon(named "Falling Rocks Canyon" by Brosius, et al) and down the main canyon of Paiute, north along the Blue Monster Mine road back to the vehicle.

Lead Canyon is entered by a dirt road, to the 6,100 foot level, where two prospectors' cabin stand. The claims are active to this day. Above the cabin sites there is little sign of man.

Twenty-six burro sightings were noted on the Lead Canyon Fan. These burros water near the cabins in Lead Canyon with trails being well established and impact on vegetation very heavy. Grasses are not to be found, cropping is apparent on desert trumpet, creosote, rabbitbush, and sage. No burro sign was noted above 6,400 feet in Lead Canyon, with sign above the cabins being thin.

Three prospectors from the Morning Sun Mining Company in Saline Valley were contacted while they were visiting Lead Canyon. They told of noticable increases in the burro herd in the last three years, due to the fact that people can no longer capture these animals for pets or beasts of burden. They also mention noticable increased impact on the vegetation in Lead, Willow, and Paiute Canyons. The prospectors are Alan and Glen Akin, and Dan Dickman. These men should be consulted by the Forest Service and the BLM for recommendations concerning burro management in the Saline Valley and the eastern Inyo Range. See recommendations in Appendix III.

The idea of wrangling in specified areas is the most ecomonical, humane, and publicly accepted burro management. Akins and Dickman tell of dozens of wranglers making annual trips to Saline Valley, and capturing enough burros to keep the population maintained at static levels. The Forest Service should contact these wranglers (using California Department of Fish & Game files containing those who were issued permits) and have a program implemented at the mouths of Lead, Paiute, and Willow Canyons. This would relieve pressure now put on the bighorn sheep in Paiute and Willow Canyons. This will be described shortly.

No bighorn sign was found in any sector of Lead Canyon surveyed, and no sightings are to be found in records or interviews. The terrain, with thick stands of conifers and Cercocarpus is unlikely bighorn habitat (See Hansen Habitat Analysis in Appendix IV).

Deer sign was found to be sparse in Lead Canyon. A single scat pile was found at 7,000 feet. Beds may be present on the north facing slopes, but these were snowbound on the authors visit, November 11, 1974.

No cattle sign is present in Lead, Paiute, or Willow Canyons.

Falling Rocks Canyon to Main Fork Paiute Canyon

The canyon was named by Brosius, et al, during their summer wildlife survey for the Inyo National Forest. Falling Rocks got its name because of bighorn kicking rocks down the steep slopes while Brosius, Glicken, and Nielsen made their way down to Paiute Canyon. This is the only bighorn concentration area visited during the author's study and the most graphic display of active competition.

Sign of bighorn, deer, and burro was not present at the 7,600 foot level which was the area entered into from the Lead Canyon hike. Very excellent grasses are present in this region. At 6,800 feet two sheep beds and three pellet groups were found in the wash bottom. Two dryfalls were descended with sporatic spore of sheep found. After passing a fork, willow thickets, dense thistles, fine grasses, and rabbitbush announced the presence of a good spring. Bighorn sign became heavy, with approximatley fifty to sixty pellet groups present in the wash. Good access to the water through the vegetation made sign more common. Most sheep descend the west slope to water and feed, while about twenty-five per cent appear to use the east slope.

Brosius found the skull of a three and one half year old ram at the 6,400 foot level in July, 1974. The author discovered the atlas and femur of bighorn in this area. The atlas was probably that of a ewe or young ram. After a mile or mile and one half, the spring flow ceased, but sheep sign remained common.

Sign was still heavy when dense vegetation broke to sparse entryways, providing access to grasses and canyon vegetation. At 5,200 feet another spring surfaced but sheep sign could not be found, as the feral burros took over here, their sign becoming dense and appearing to completely displace the bighorn. The burro has penetrated quite far considering the density of the willows, but will not be able to scale a dryfall at 5,600 feet. Grasses in the bighorn area were common and of good quality, yet when burro range was entered, the grasses were almost non-existent, those few present being grossly reduced. Willows are used only slightly by burros as a food source, but are trampled extensively for passageways. Creosote, rabbitbush, Atriplex, and bunch grass were heavily used and three samples of perennial bushes could not be identified due to the lack of acceptable smaples. The plants had been totally reduced in large areas. This occurance was common in Paiute Canyon on the plateaus above the streambed. The grassy beds in the watercourse are cropped completely.

Grasses are a mainstay in the diet of the desert bighorn. The graphic displacement of sheep by feral burros in the Paiute Canyon area is but an indicator of what has happened over the entire century on the lower east slope of the Inyo Mountains. A single horn of a ram, very eroded, and old, was found at 4,400 feet in Falling Rocks Canyon. This horn was probably more than fifteen or twenty years old. No contemporary sheep sign is present in this area, but the horn is evidence to the fact that sheep once inhabited the entire canyon area, before displacement by the burro.

If permits were granted to collect feral burros as pets or beasts of burden in specified areas of the east slope, bighorn sheep could be relieved of this exotic pressure and would undoubtedly reinhabit much of their former range.

The burro will venture as far into a canyon as is necessary to find good water and feed. This behavior means displacement of the native bighorn which also need the water and grasses. If wrangling of burros was implemented only on the alluvial fans in this area, the burros would not enter the narrow canyons, when stressed for water, but would remain in the Saline Valley area where they would be protected from capture. Use of sites such as Waucoba Spring would increase, but water could be made available in the valley without extreme cost to the agencies involved.

Willow Creek

Finally emptying into Saline Valley at 2,400 feet, Willow Creek begins at 9,600 feet on the crest of the Inyo Range. An operational talc mine, the White Eagle, works full time at 3,000 feet in the main fork. A cluster of homes and storage houses is situated at 2,287 feet. Three important water sources arise at 4,500 feet in the middle fork.

Bighorn sheep have been sighted in Willow Creek infrequently, including six ewes sighted by John Lawrence at the talc mine in 1972. Akins and Dickman report one sheep just above the south fork confluence. In 1962, three sheep were sighted and ten were noted there in 1955. Vern Burandt reported a single ram at Willow Springs in 1968.

Burros water frequently at Willow Creek Camp, with trails converging here from many directions in Saline Valley. A dead burro was found by the author, one half of a mile northeast of Willow Creek Camp, one hundred feet west of the road. Cause of death is unknown.

This canyon is another important one, in which the burro capture program

should be instituted. A concentrated effort near the mouth of the canyon, could quickly eleviate the burro pressure upon the vegetation and the native wildlife. A sustained effort would insure this canyon relief from this exotic impact.

Pat Keyes Canyon to New York Butte

Vern Burandt is the most expert person concerning bighorn in this area. Burandt stated in an interview that one quarter mile west of Pat Keyes Spring, he found the largest concentration of bighorn beds in his twenty years as a game warden in this area. He made the find in 1968. Also in 1968, he sighted three rams southeast of New York Butte, six rams in Hunter Canyon and six skulls southwest of New York Butte. The fresh carcass of an adult ewe was found below Cove Spring in 1968. As mentioned previously in this paper, the author rediscovbonesand horns of several sheep in the Beveridge townsite. These had been found by Burandt in the 1950's. No contemporary sheep sign is found in the lower Beveridge Canyon area. Fresh tracks of several rams were noted by the author on the sage flats one and one half miles north of New York Butte. This is on the south rim of Beveridge Canyon between points 10,260 and 10,186 on the New York Butte, 15 minute quadrangle.

Beds are also reported on Keynot Canyons' south slope.

Inyo Mountains

All canyons between Daisy Canyon and North Fork Paiute are considered by the author to be important bighorn sheep strongholds. Considering the more than one hundred years of constant pressure upon the desert bighorn sheep in the Inyo Mountains, the sheep are relatively releved presently. The threat remaining today is the pressure of feral burros from Saline Valley and possibilities of

large scale mining entering the range. Little to no possiblity exists of burros entering the canyons of Pat Keyes, McElvoy, Keynot, Beveridge, Hunter, Craig, or Daisy, due to the extreme topographical relief. The problem areas, then, remain Paiute and Willow Canyons. If recommendations are implemented there, concerning burro capture, and are implemented in the entire east range concerning large scale mining, the bighorn has a chance for recovery. It has been a matter of only a few years that mining pressure has let up on the sheep numbers in this range, not long enough for the sheep to show signs of resurge. With the removal of the burro pressure as described, the bighorn can be expected to hold their own and possibly show a comeback in the Inyo Mountains. The decision is in the hands of the Federal Government.

VI THE NATIVE AND EXOTIC UNGULATES

Natural History

The desert bighorn sheep and the mule deer are the only hooved animals native to the study area. Cattle are commercially grazed, while horses and burros were introduced long ago by man. In most areas of the range sufficient forage, space, and water exists to support one or possibly two types of large herbivores, in certain numbers. The horse and deer, for example, coexist in a nuetral state in many areas of the eastern White Mountains. It appears that severe degradation of the native flora has occured where cattle graze along with the horse and deer. As far as management of the National Forest is concerned, horse cattle, and deer, should not be allowed to graze on the same range. Cattle should be controlled in most instances in order for the wild animals to maintain a natural balance.

Bighorn sheep are affected by competition with the horse, cattle, and to a lesser extent, deer, in the White Mountain Range. As small a number as two to f four horses on Pellesier Flats, has caused the bighorn range to retract towards the western scarp of the White Mountains. Cattle grazing in Birch Creek and on Chiatovich Flats has caused bighorn to retreat from Leidy Creek, Chiatovich Creek, Mount Hogue, and Birch Creek. Bighorn are affected by burros in the Inyo Mountains, causing the loss of habitat such as Paiute Creek below 5,200 feet, Willow Creek, and probably the base of the range along Saline Valley.

Horses, burros, and cattle are capable of entering many rugged areas of the ranges, thus encroaching upon bighorn strongholds. Horses have surmounted many

natural barriers to graze as high as 13,200 feet in the northern range. Burros have trampled through the dense undergrowth in many narrow canyons to encroach on important bighorn watering areas in the Inyo Range. Cattle are found above 12,000 feet and so, intrude on historical bighorn summer range in the White Mountains.

The reasons for the desert bighorns incapability to coexist with competitors are many and complex. Simply, the bighorn is timid and rarely tolerates the presence of man, livestock, structures, or vehicles. The idea of spacial competition was raised by Dave Dunaway in 1971 in a memo on file in the Supervisors Office in Bishop. Dunaways idea was that cattle were displacing bighorn in the southern Pellesier Flats simply because of competition for space. The bighorn will not tolerate constant presence of other large herbivores in most instances. Deer and sheep ranges are found to be quite distinct with little overlap in most areas of Anza-Borrego Desert State Park in California(Jorgensen and Turner, 1972-1974).

The desert bighorn requires grasses in its diet, and if the grasses are of poor quaility or have been overused, the sheep may temporarily or permenantly abandon an area. Basic adaptations of bighorn allow it to very efficiently utilize available forage. Bighorn sheep are ruminants, meaning food is broken down in the rumen, to effectively remove as many nutients as possible. This process of food breakdown may take as long as 70 to 100 hours in a ruminant (Vaughan, 1972). In contrast, the Equids, including the horse and burro, are inefficient in their digestion. Equids do not possess a rumen, and food passes through the gut of a horse in 30 to 45 hours(Vaughan,1972) meaning many nutrients are not assimilated by the system and are passed out as feces. The size and

weight of the Equids compounds the situation when they are compared to the bighorn sheep. Horses average 900 to 1,100 pounds, burros 315 pounds(Knut-Schmidt Nielson), and bighorn sheep females average 120 pound, while adult males average 170 to 185 pound. With larger biomass, the Equidae must consume more energy in the form of grasses, shrubs, and forbes. Bighorn are estimated to utilize approximately two per cent of available vegetation in the range, but the presence of the exotic horse or burro increases the vegetation utilized overall, ten fold. Therefore, the bighorn retreat to more rugged terrain, seeking optimum feeding conditions, and in the long term are squeezed to an island of habitat, usually surrounded by man, burro, horse, deer, or unusable range.

Behavior in the area of water is an important consideration with desert sheep. It was found on this survey that the wild horse does not foul or destroy the natural water sources. In no case was wild horse fecal material or urine found in the water sources in horse range. Cattle and burro are contray however. All water sources in burro or cattle range contained amounts of feces or urine which are in all probability, undesirable to the native bighorn. This, coupled with the exotics habit of completely cropping all grasses in the water area, discourages the use of these sources by the desert bighorn sheep.

Wherever bighorn can recover range lost to them to exotic ungulates, the National Forest should make every effort to remove or significantly reduce the exotic. Bighorn should be the Forests first pricrity in the study area and every channal must be investigated to enable these natives to reestablish in this range. The wild horses and feral burros can be managed and interpreted to the public as per recommendations in Appendix III.

VII NATURAL PREDATION

Three animals capable of preying upon bighorn sheep occur at natural population levels within the study area. Significant field sign and reports by reliable sources conclude that thrifty populations of mountain lion (Felis concolor), coyote (Canis latrans), and golden eagle (Aquila chrysaetos), occur in the White and Inyo Mountain Ranges. Mountain lion are common in the White Mountains(Powell, per com) and tracks were found in the Narrows of Marble Canyon in the eastern Inyo Range. Coyote sign was found in all canyons and flats of the White and Inyo Mountains and as high as 13,550 feet on the tundra of the White Mountains. Golden eagles were sighted every day in the White Mountains in all canyons north of Cottonwood Canyon and were sighted from 4,000 feet in Fish Lake Valley to well over 12,500 feet over Pellesier Flats. Sightings were made in Waucoba Canyon and on New York Butte in the Inyo Mountains.

Due to the low population density of bighorn sheep within this vast study area, occurence of predation is probably relatively rare. It is possible that predation occurs infrequently on winter range when snows drive the bighorn down slope, but the rugged canyons of the winter range would make even this difficult on the predator.

The large predators assuredley take advantage of the high deer populations and moderate numbers of chukar, sage grouse, Audubon cottontail, chipmunks, and in the northern areas; the Townsend hare and the yellow-bellied marmot form a part of their diet.

No conclusive finds of natural predation upon bighorn were found during this

survey but discussion of the three major predators is warranted and individual description of bighorn predation in other ranges follows. The same occurences take place infrequently in the study area, so can be applied in the Forests study of the ecology of the desert bighorn sheep.

Mountain Lion

Having spent some twenty-five years hiking the entire White Mountain Range, Doug Powell has sighted many mountain lion and concludes they are relatively common. Tracks found in the Narrows of Marble Canyon in the Inyo Range prove they also inhabit that area and probably venture into most all canyons of both ranges at various seasons. Prospectors Aken and Dickman stated in an interview that "A couple lions work the central Inyo Mountains"(Willow Creek to Marble Canyon). Warden Vern Burandt states he has sighted tracks of only one mountain lion near Willow Springs(DBCT 1970).

Mountain lion are known to have preyed upon bighorn which were transplanted in Dutch Creek, western Nevada(Nick Papez, per com, 1973), just east of the White Mountains. Evidence appearing to be the prey of mountain lion was found in 1972 in the In-Ko-Pah Range, California near the Mexican Border. Again in January, 1975, evidence of lion predation was found in the San Ysidro Mountains of Southern California, seventy miles north of the 1972 find(Jorgensen and Turner).

Bighorn of the White Mountains would be suseptable to lion predation on the edges of Pellesier Flats where escape terrain is in isolated rock piles and on small cliffs. But, bighorn are using this upper area less in the past three to five years and have tended away from its use due to Pellesier Flats habitation by feral horses. In the Inyo Range, the bighorn would be susepatble to lion predation in the narrow canyons near waterholes, especially in the summer.

No sign of predation upon the feral horses or burros was found, although lions are capable of rarely taking a colt of either specie or a disadvantaged adult burro.

Coyote

Ubiquidous in the survey area, and quite capable of killing young bighorn, the coyote would be a factor in eliminating young or sick individuals from the bighorn population if that population were to reach higher numbers in these ranges. Again, due to the low density of bighorn in both ranges, incidence of predation is likely to be rare. Two cases of coyote predation upon desert bighorn within a single week were documented in July 1974 in the Colorado Desert of California (Jorgensen and Turner 1974). Coyotes are known to frequent all elevations of the White Mounains at all seasons(Powell, per com). Areas of high suseptability are again, Pellesier Flats of the White Mountains at 13,000 feet and all water sources frequented by bighorn in the Inyo Mountains.

Coyotes form an important part of the ecosystem by reducing sick or weakened individuals of many animal populations. The coyote maintains quality among bighorn populations elsewhere throughout the West, and would in these ranges if the bighorn populations were at natural levels.

One coyote was killed on Pellesier Flats on opening day of deer season by a Los Angeles deer hunter. Asked why he killed the animal, he stated "It was only a coyote". The animal was shot four times while the hunter sat next to his motorcycle. The hunter never left the motorcycle, which he had driven up the Indian Creek Trail. It is unlikely the coyote would challenge young of either the feral horse or burro and does not appear to be a limiting factor for either of these feral populations.

Golden Eagle

The golden eagle is the most common bird of prey in the northern White Mountains, and according to a report of Ober(1930) is capable of preying upon the desert bighorn. In that case, in Death Valley, a pair of golden eagles repeatedly attcked a young ram which ultimately killed the ram with punctures to the kidneys. More than twenty sightings were made in the White Mountains, of what was suspected to be at least four to six different individuals between Cottonwood Canyon on the west slope to Trail Canyon in Nevada. Two sightings were made in the Inyo Mountains.

If eagle predation upon bighorn occurs, it would be probable to take place in the upper elevations of the White Mountains in the lambing areas during Spring. The golden eagle perhaps has the most chance of preying upon a young bighorn, over the lion or coyote, because of its wide range and habit of soaring above the steep rocky crags inhabited by the bighorn. Other animals falling prey to the golden eagle in the study area, are young deer, marmots, Townsend hare, cottontail, pika, chipmunks, gophers, and the California ground squirrel (Spermophilus beecheyi).

Any of these predators have the physical and behavioral capabilities of taking bighorn sheep. The bighorn would be vulnerable to predation in deep snows of winter, whech last only a short time on the well exposed west slopes (Powell), in the lambing areas, or if weakened by pnuemonia or injury. The area within this survey which sheep are particularly vulnerable is Pellesier Flats in the 13,000 foot region of the White Mountains. Bighorn use of this region has become non-existant compared with sightings in Forest Service records of

years previous to 1970.

Predation is not seen as a limiting factor in the population of bighorn sheep within the Inyo or White Mounatins. Bighorn numbers are too low and scattered for predation to be a constant limiting factor.

VIII MANS USE OF THE NATIVE AND EXOTIC UNGULATES

Five species of ungulates inhabit the study area, two of these are native, and three exotic. All have been used by man as a food source or beast of burden in the past; and two, the deer and domestic cattle are still used as food today. Bighorn sheep have been fully protected since 1873 in California yet were used as a food source for miners and the Native Americans. Horse and burro were used as a food source in the past, as well as beasts of burden when captured and trained. The following information was collected in the field and through interviews with people in the Owens Valley and Saline Valley areas.

Bighorn Sheep

Mans earliest use of bighorn sheep in this area was by the native Paiute people who inhabited these ranges in summer for collection of pine nuts and for hunting deer, bighorn sheep, and sage grouse. Evidence of this habitation is found at all elevations by scattered arrowheads, chipping sites, grinding stones, and obsidian and chert cutting tools.

Reports of a ring of sheep horns on th summit of Indian Peak(11,297) in the White Mountains were received from a local deer hunter, Don Hutton. Another report supporting this appears in the files of the Inyo National Forest, Bishop. That the Native Americans use of bighorn was relatively intense was confirmed by a find made during this survey. In upper Middle Creek, on the Nevada-California border in the White Mountains, was found an encampment in the vicinity of a year-around water source. A chert arrowhead and scraper were found on the

site. Scattered among the needles and cones were fifteen horn sheaths of bighorn sheep. All were very decayed and pealing apart. After examining all the horns, it was found they were from at least nine different animals, all adult rams of approximatley six to eight years. Estimate of age was made by horn conformation. Also found in the area was a cervical vertebrae and a small segment of pelvic bone. These bones were taken to the Los Angeles County Museum and identified as Ovis canadensis. Association of bighorn sheep horn and Native Americans habitation is common in the deserts of Southern California, where horns are found within caves of prehistoric sites(Jorgensen and Turner, unpubld.). Burandt (1970) also describes bighorn remains in mining camp dumps on the west side of New York Butte, Mexican and Cerro Gordo Springs, and Burgess, near New York Butte. Skulls of bighorn were found in May 1974 by the author in Beveridge townsite in the southern Inyo Range. These were described by Burandt in 1970 of the Desert Bighorn Council Transactions. The miners of Beveridge used the bighorn as a food source beginning about 1850 and local resident Indians continued to use them as food into the 1950's(Akin and Dickman, per com). If this practice was common elsewhere in the range, and there is no evidence contrary to it, the bighorn of the Inyo Range were under intense hunting pressure, and this no doubt began their demise in that region. Mining activity also usurped water sources such as Mexican Spring and Cerro Gordo Spring(author visit, June 1974 and Burandt 1970 and per com). Tramways disected the Inyo Mountains to bring salt from Saline Valley to the edge of Owens Lake(De Graff, Powell, per com) and this activity as well as prospecting in virtually every canyon in the Inyo Range undoubtedly had detrimental effects upon the resident bighorn populations.

Modern day poaching of bighorn sheep in the White Mountains or the Inyo

Mountains is highly unlikely. Due to the low density and numbers of bighorn, ruggedness of the range, and its inaccessability, the chance of a human taking a bighorn are very low. Ones chance of even seeing a sheep in these ranges are very poor. After more than 125 miles of intense investigation on the eastern edge of sheep range, in both mountain chains, not a single live bighorn was sighted.

Deer

Early use of the resident deer populations was probably even more intense than the use of bighorn due to more expansive habitat and more dense populations. The Paiute no doubt took full advantage of this resource, but no trace remains today of their utilization of deer, due to the fragility of the antlers and thin bones.

Miners over the last one hundred years undoubtedly used deer as a main food source. Deer populations today are high in both ranges and deer hunters are ~~fou~~ found in high numbers in Indian Creek of the White Mountains and are reported in large numbers in certain areas of the Inyo Range such as Whipoorwill Flats, Waucoba Canyon, and the upper flats(Garber per com). Some problems are caused with these high numbers of hunters, such as the use of OHV's in the tundra region of Pellesier Flats and some illegal hunting which occurs upon sage grouse populations, as well as the indescriminate shooting of some predator species(See "Coyote", under Natural Predation).

Horse

Since classification of the feral horse as a protected species under

Public Law 92-195, round-ups and use of the horse as a food source has ceased. Reports that the local Indians on the Nevada side of the White Mountains still round up colts during the summer were received by a confidential source. This w would be possible in certain areas of Trail Canyon, Middle Creek, and Chiatovich Creek, but no sign or occurences were found by the author. Most of the feral horses are rather immune to capture by virtue of wariness and habitation within rugged canyons and high on steep barren slopes around 12,000 feet.

A man in the Big Pine area speaks of working as a buckaroo in the early 1960's capturing wild horses in the Trail Canyon area of Nevada. Present reports are t that the feral horses have ranged further up into the White Mountains since the 1960's (Ayres,Powell, per com).

Burro

Now protected under Public Law 92-195, the feral burro has been used as a food source extensively for almost a century, and has had the reputation of being one of the best tasting meats ever encountered(Hiehle, Holton, Weaver, and confidential sources,per com). Capture of these animals for pets and beasts of burden, was also practiced until passage of Public Law 92-195 in 1971 and was resumed on a small scale under permit in Death Valley National Monument (Sanchez, 1973,1974, per com). Today the illegal use of feral burros is light, and only an occassional arrest is made within the survey area(Burandt,per com). Illegal capture of feral burros for pets or beasts of burden is not easy or profitable and the use of burro as a food source is not profitable due to its illegality and the remoteness and severity of climate in this region. The Saline Valley region, just east of the Inyo Mountains was set aside as a feral burro refuge in 1957 by the State of California. Therefore virtually no harras-

sment of the feral burro occurs within the survey area and no legal use of the feral burro or horse occurs, save for the aesthetic enjoyment of these wild p populations.

Cattle

As far as can be discerned by this study, no wild populations of cattle exist within these ranges. Grazing is permitted, however, under regulation of the U.S.D.A. Forest Service, White Mountain Ranger District, Bishop, California. Cattle grazing is practiced each year in the canyons of the eastern White Mountains and sporatically in the upper flats of the northern Inyo Mountains. The Inyo pastures have had two years of non-use by the cattle owner(Reid, per com). Cattle were found in Trail Canyon, Middle, Chiatovich, and Indian Creeks, past the removal date this Fall. Considerable sign of cattle was present in Chiatovich Flats, southern Pellesier Flats, upper Birch Creek, upper Indian, Davis, and Cabin Creeks, Cottonwood Creek(east side), and Tres Plumas Meadow and Flat. All these cattle are shipped out as a human food source when they reach the proper age and size. The number of cattle allowed to graze the northern White Mountains from Cabin Creek to South Chiatovich Creek is 150 head(Reid,per com).

Poaching and predation upon these domestic cattle is thought to be non-existant. No harrassment of these cattle occurs because of their remote location.

IX DISEASE

Twenty-five samples of scat were collected in bighorn range in the White Mountains by the author, in September and October. These were sent to Terry Russi of California State University, San Diego, who is presently doing graduate work on parasites of desert bighorn sheep in Anza-Borrego Desert State Park. Russi studied fourteen samples closely, discovering what he termed as signicantly high infestations of pinworms and some cases of lungworm. Because of his status at the university and the state of his Masters work, he is not allowed to publish results of work he is now prossessing, but this will be possible upon completion of this thesis. At that time, the important results of his work will be made available to the Inyo National Forest.

No specimens were found in weakened condition and no fresh carcasses were discovered on this survey.

X CONCLUSION

The main thrust of this work has been to bring the problems of the desert bighorn sheep to light for the Inyo National Forest. Actually, much more money and time needs to be allotted to the problem to thoroughly bring all problems to light.

Competition by burros is extreme in those areas described in Part V of the report. The problem of cattle grazing under USFS permit on bighorn ranges cannot be overemphasized. The cattle problem is a tangable one, directly in the hands of the Forest Service, and it is one which has been grossly overlooked considering impact on the range in general, bighorn in particular. The grazing

in Inyo National Forest should be completely reassessed.

Wild horses create enough competition on Pellesier Flats, Chiatovich Creek, Indian, Middle, and Davis Creeks to displace the bighorn sheep. Recommendations for horse management are made in Part V and in Appendix III.

The entire question of bighorn sheep in Inyo National Forest is one which must evaluated completely and quickly. To have bighorn, or to have grazing and high impact activities such as large scale mining and certain recreational forms. This is what lies before the National Forest. The future of this animal is entirely under the control of the agency. The Forest can treat this resource as a valuable exhaustable one, and take all possible steps to save it from its obvious present decline, or the Forest can treat it as a second rate, unimportant resource and possibly, too late, find it exhausted.

APPENDIX I

Bighorn Sheep Sightings Reported to Inyo National Forest

1928	Lone Tree Canyon	35 head
1950	Deep Springs Doug Powell	10 to 15 common
1951	Sand Spring	19 head
1951	N. of Sand Spring	3 head
1954	Upper Lone Tree Canyon	11 head
1954	Leidy Creek	1 horn
1954	Deep Springs (SE of Lakebed)	4 head
1954	SE White Mountain Peak	22 head
1955	White MTN. Peak	28 head
1955	Lone Tree Canyon	10 head
1955	Between Willow and Pellesier Creeks	2 horns
1955	Deep Springs 3 miles E. of lake	14 head
1955	Mahogany Flat	3 carcasses
1955	Willow Springs	10 head
1955	Deep Springs	45 head 3 different sightings
1956	Lone Tree Canyon	14 head
1956	Silver Canyon	1 ram
1958	S side White Mtn. Peak	1 skull
1958	Leidy Creek	1 horn
1958	Lone Tree Canyon	17 head
1959	Lone Tree Canyon	2 head
1961	W. of Saline Valley	2 head
1962	Willow Springs	3 head
1962	Hunter Canyon	3 head
1962	Pellesier Flats	5 head
1962	Indian Creek	4 rams
1962	White Mtn. Peak	7 head
1963	Deep Springs	1 ram
1963	Pellesier Flats	1 horn
1963	Leidy Creek	1 ram
1958	Leidy Creek Doug Powell	22 head
1963	Davis Creek	1 horn
1963	Lone Tree Canyon	4 head
1964	White Mtn. Peak	1 horn
1964	White Mtn. Peak	4 rams
1964	Head of Leidy Creek Jack Hiehle	9 head
1965	Pellesier Flats	8 head
1965	Lone Tree Canyon	30 head
1966	Boundary Pk.-Montgomery Pk. saddle	13 head
1966	Lone Tree Canyon	6 head
1966	Lone Tree Canyon	1 carcass lamb
1966	5 miles NE of Big Pine 1 mi.NE Westgard	1 horn very old
1968	Lone Tree Canyon	1 ram
1968	Between Cottonwood and Willow Creek	6 head
1968	South side of Birch Creek	beds

1968	Beveridge Canyon below Cove Spring		1 fresh carcass ewe
1968	Keynot Peak South slopes		beds
1968	Beveridge Canyon townsite		old skull
1968	Montgomery Canyon		beds and tracks
1968	Montgomery Canyon		1 ewe, 1 lamb
1968	6 mi. NE of Big Pine on Westgard Road		1 ram
1968	Falls Canyon	Cole	1 carcass small ram
1968	South of Black Eagle Mine	Thompson	8 head
1968	¼ mi. W. Pat Keyes Spring	Burandt	beds
1968	Willow Spring and Vaughan Gully		1 ram
1968	Upper Coyote Canyon	Burandt	Ram skull trail marker
1968	Bighorn Mine Hunter Canyon	Burandt	6 rams
1968	3 mi ESE New York Butte	"	3 rams
1968	1½ mi SW New York Butte	"	6 skulls
1968	2 mi S Burgess Well	"	skull
1968	Mexican Spring	"	1 ewe, 1 lamb
1967	1 mi SSE Cerro Gordo Spring	"	skull
1966	Mazourka Canyon near Barrel Spring		2 ewes
1969	Mount Hogue		4 rams
1969	Wyman Canyon		1 ram
1969	N of Mount 13,559		2 rams
1969	S slope Mount 13,559		4 rams
1969	Pellesier Flats above Rock Creek		1 ram
1967	Rock Creek, 7,000 ft	Doug Powell	15 head
1969	Head of Indian Creek		beds and tracks
1969	3 miles S Papoose Flat	Marshal Adcock	1 ram
1970	2½ miles W Montgomery Pk.		1 ram
1972	Upper Birch Creek	Prasser	3 rams
1973	½ mi. N White Mtn Peak	Dickey	2 rams, 2 ewes
1973	3 mi. ENE of Big Pine	Hannon	1 ram
1973	Lake Tinnemaha	Powell	1 ram (same as above)
1973	Upper Queen Dicks Canyon	Sticha	1 ram
1973	Upper Dry Creek	Kathy Ayres	horns and core
1974	¾ mi. N Montgomery Peak	Dave Sharp	1 ram
1974	Falling Rocks Canyon	Brosius et al	3 rams
1974	Falling Rocks Canyon	Anita Brosius	skull of 3 yr. ram
1974	Pellesier Creek,	Paul Kimsey	ewe and lamb
1974	Upper Rock Creek	Kimsey and Erwin	beds and tracks
1974	Black Canyon Spring	Nielsen, et al	winter scat
1974	½ mi W. Hillside Spring	Brosius et al	beds and tracks
1974	Upper Pellesier Creek,	Erwin, Kimsey	beds

APPENDIX II

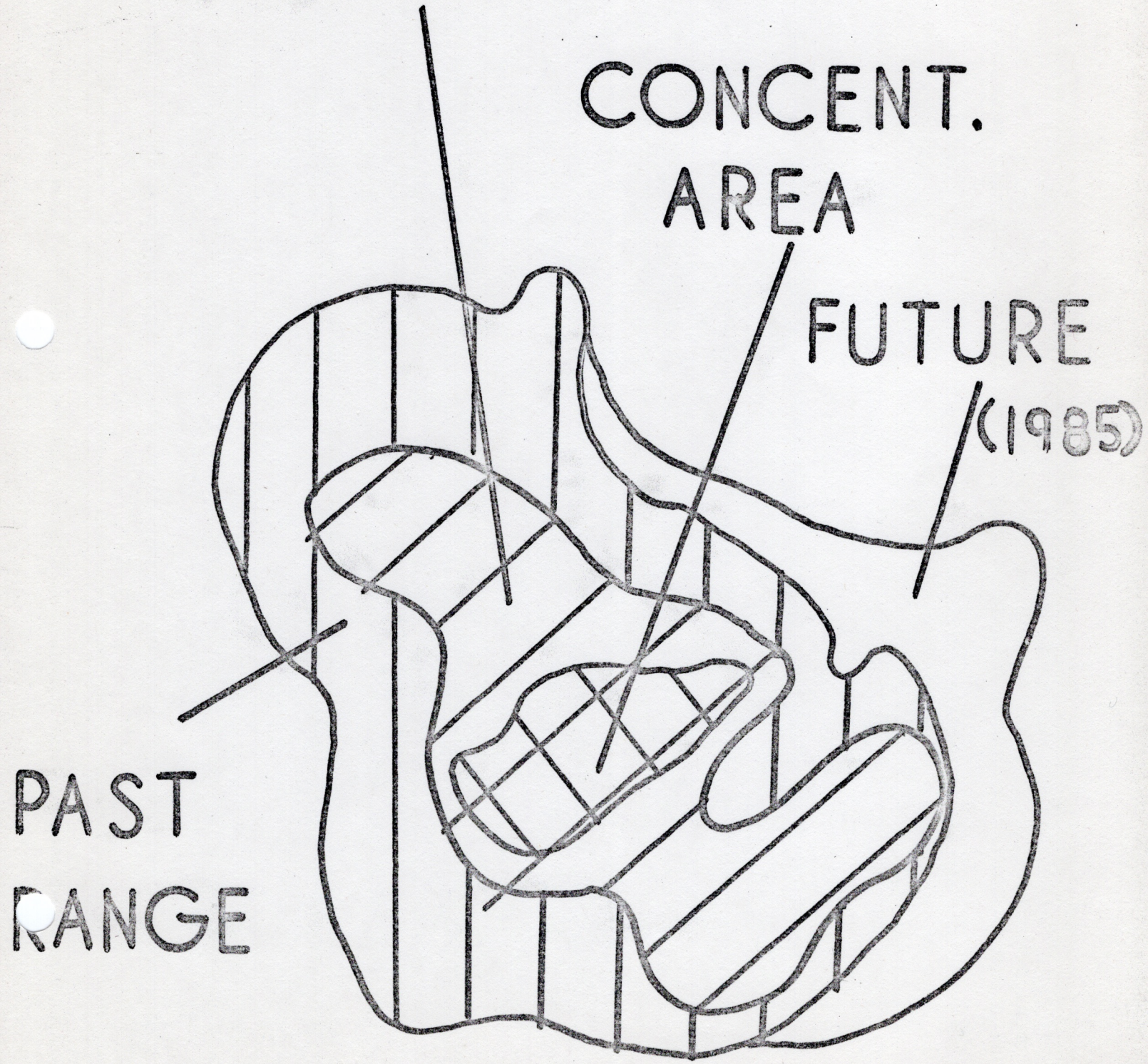
RANGE MAPS OF: BIGHORN SHEEP
- PAST
- PRESENT
- FUTURE

HORSE
- PRESENT
- FUTURE

BURRO
- PRESENT
- FUTURE

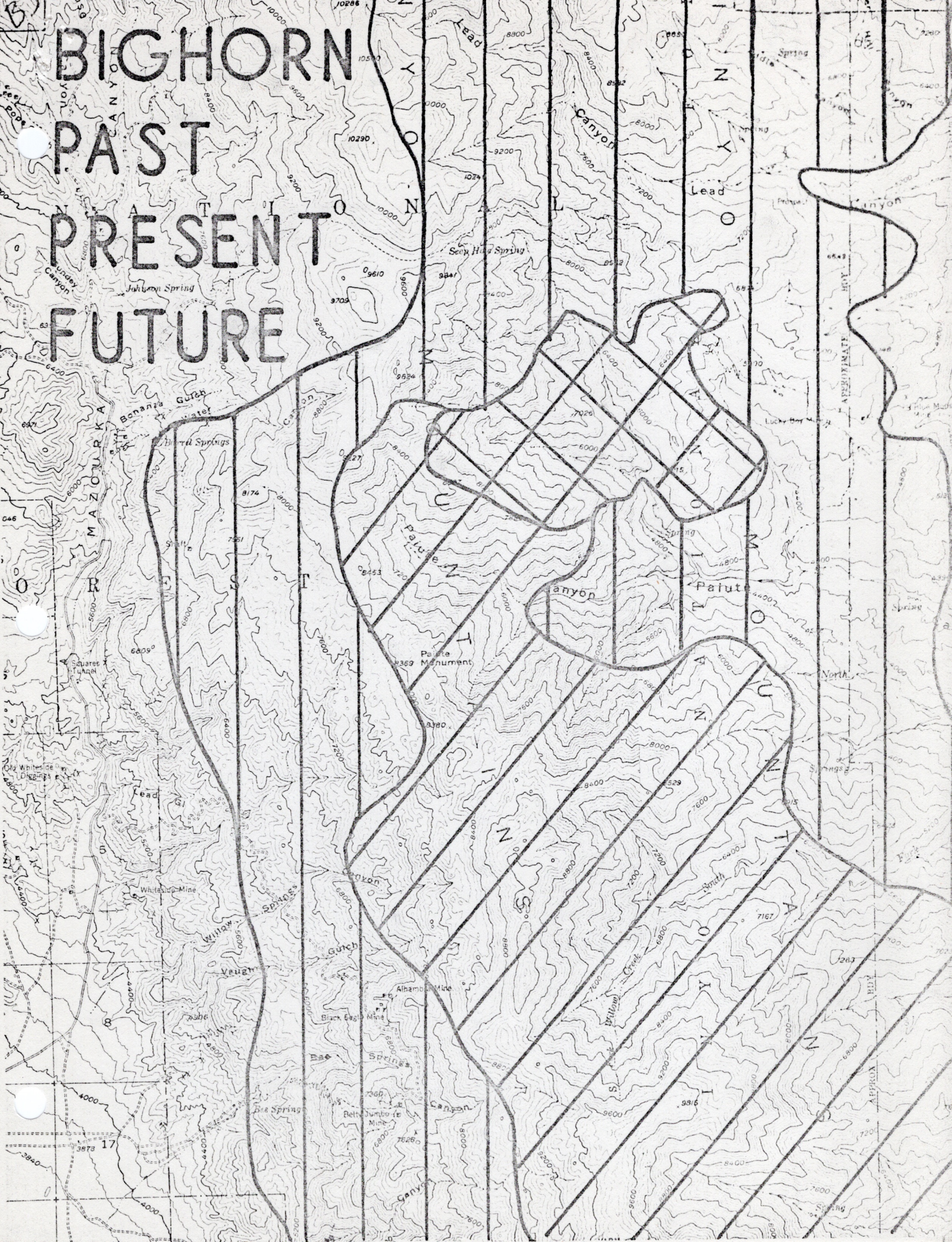
CATTLE
- PRESENT

KEY TO RANGE MAPS



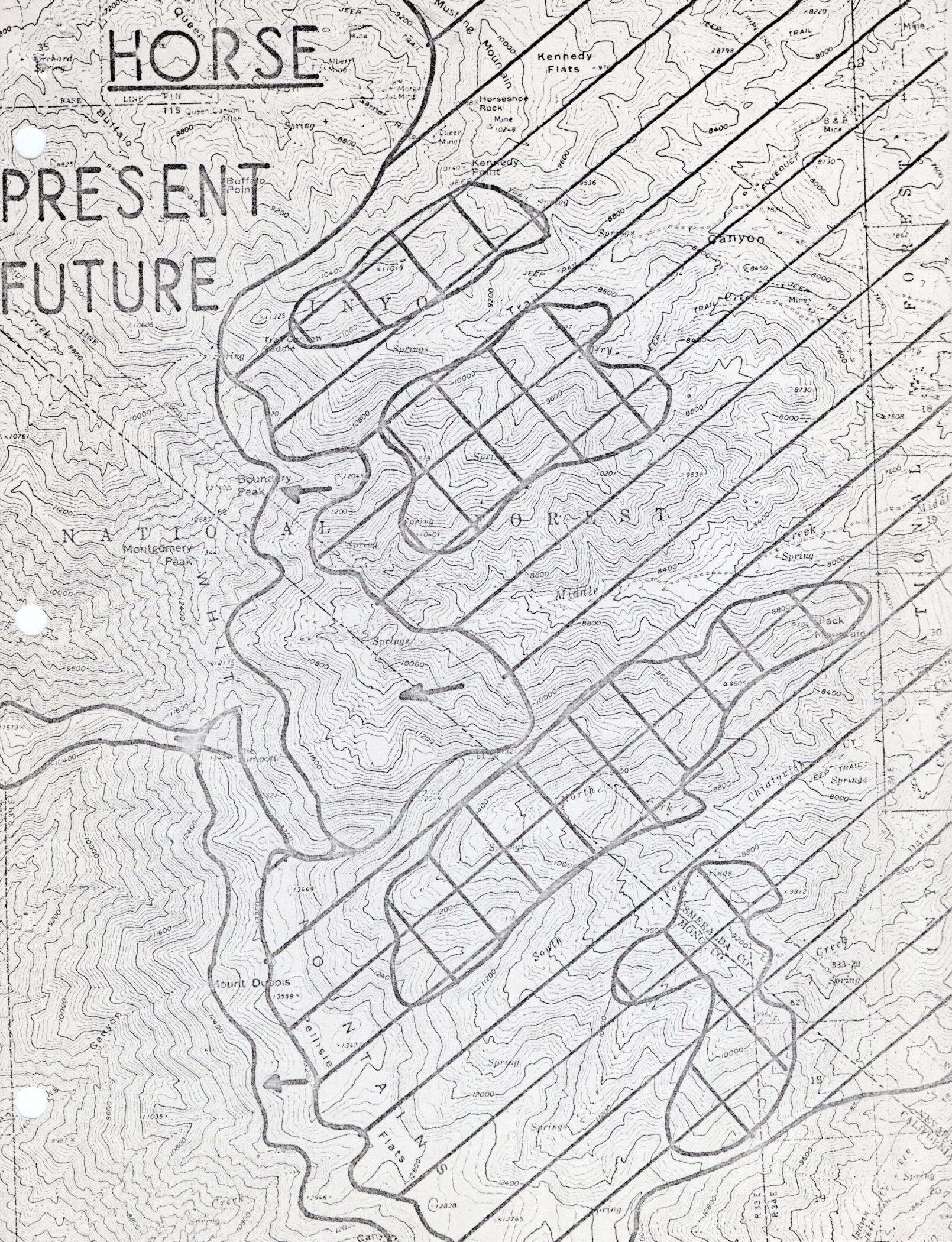
BIGORN SHEEP
PAST
PRESENT
INYO
NATIONAL FOREST
Boundary Peak
Montgomery Peak
Trail Canyon Saddle
Buffalo Point
Kennedy Point
Horseshoe Rock Mine
Mount Dubois
The Jumpoff
Pellisier Flats
Middle Fork
North Fork
South Fork
Chiatovich Creek
Black Mountains
Buffalo Canyon
Trail Canyon
Morris Ranch
MINERAL CO
ESMERALDA CO
MONO CO
NEVADA
CALIFORNIA

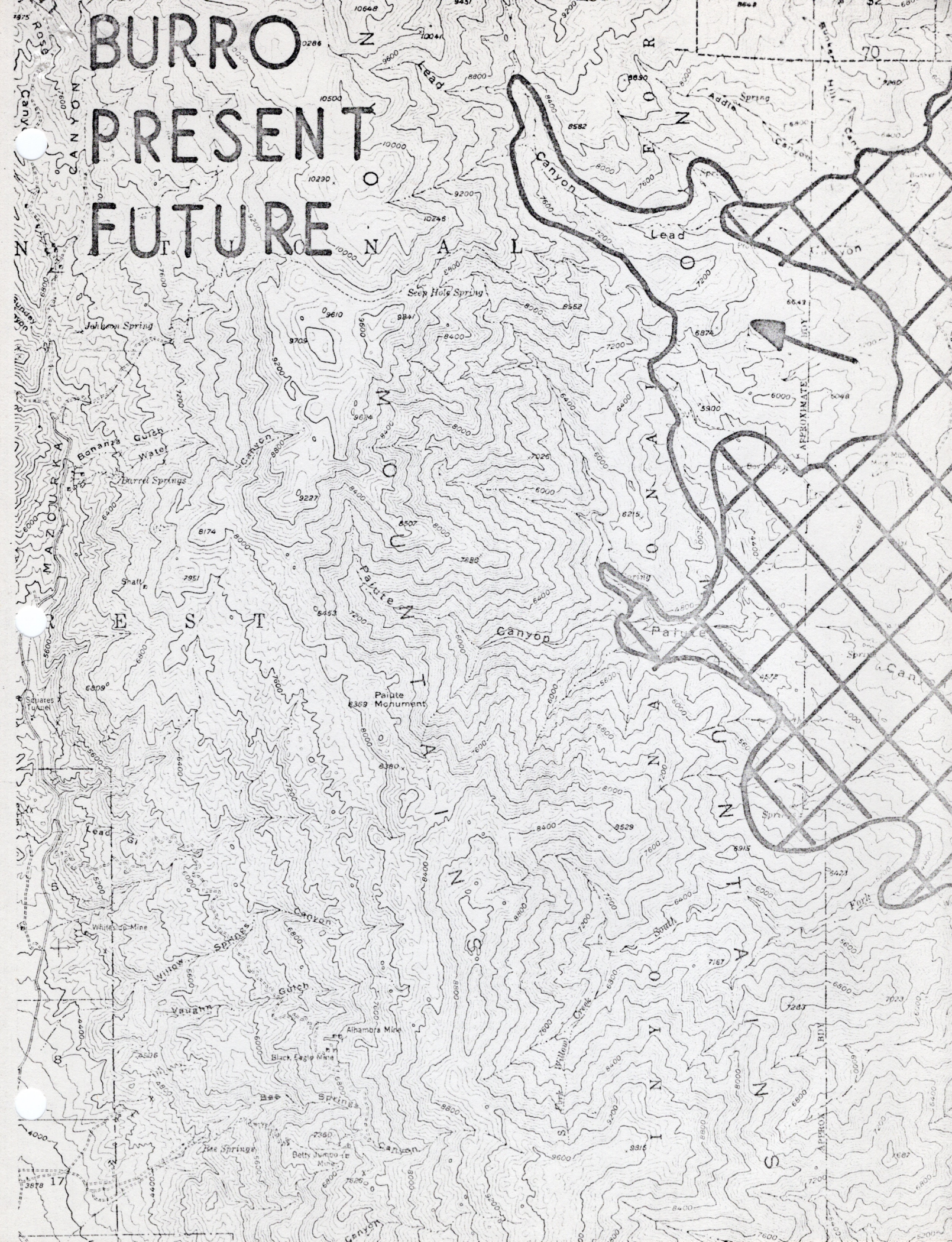
BIGHORN
PAST
PRESENT
Mt Hague
Indian Peak
Headley Peak
White Mtn Peak
Chiatovich
Cabin
Creek
Spring
Canyon
Birch
Willow
Cottonwood
Lone
Jeffrey Mine
Milner
Devernois Ranch
Hill Ranch
Aqueduct
Flume
Trail
Jeep
Pettisier
Mosquito Mine
Indian
Lady Elsie
Perry Aux
T2S
T3S
T4S
29
31
32
5
8
17
16


BIGHORN
PAST
PRESENT
FUTURE
NATIONAL
Johnson Spring
Bonanza Gulch
Squares Tunnel
Old Whiteside Diggings
Whiteside Mine
Willow Springs
Veugh Gulch
Alhambra Mine
Black Eagle Mine
Bee Spring
Belt Jumbo Fr Mine
Paiute Monument
Paiute Canyon
Lead Canyon
Willow Creek
North Fork
Lucky Boy Mine
APPROXIMATE BDY
17
8
5

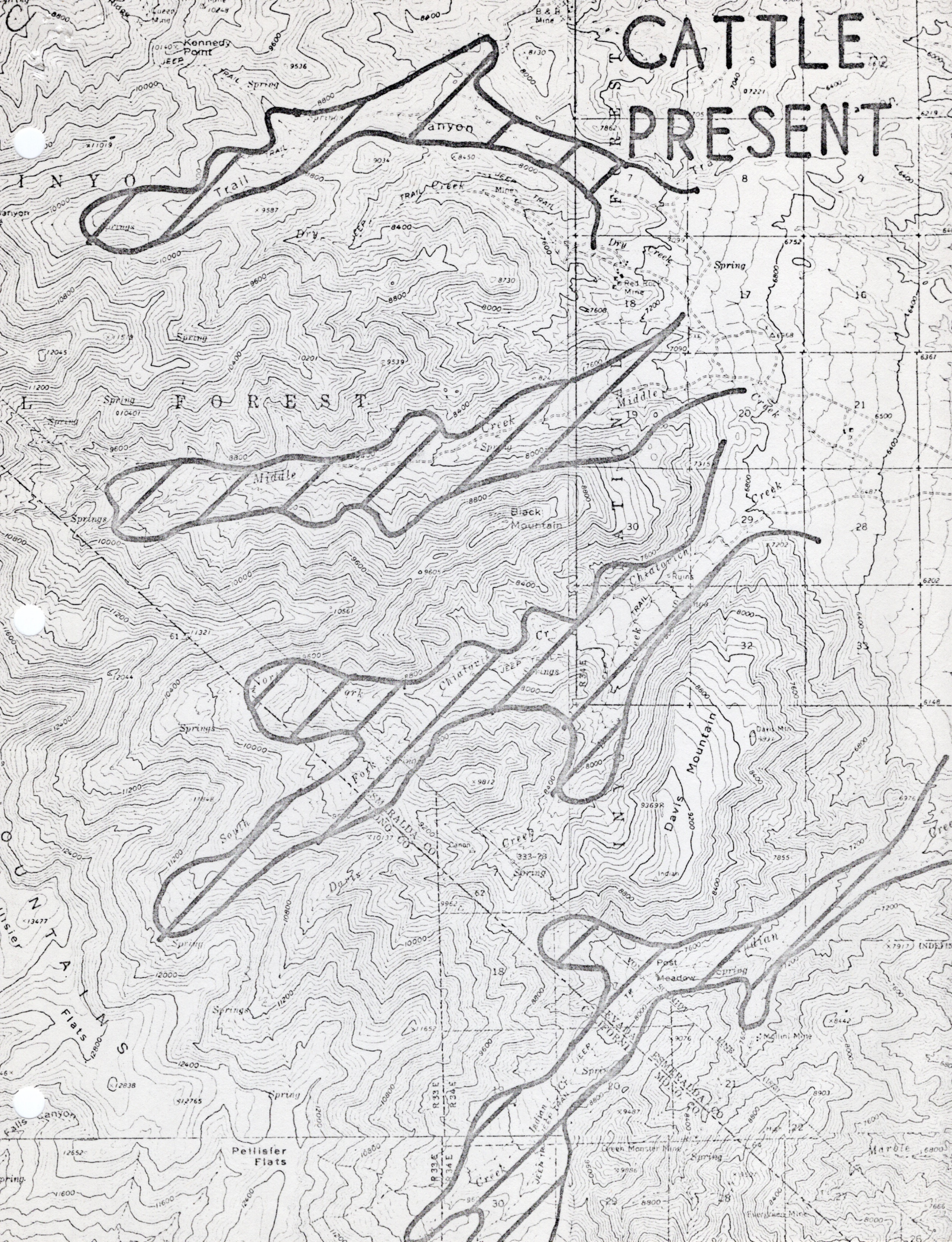
BIGHORN
FUTURE
NATIONAL
Boundary Pk
Montgomery Peak
The Jumpoff
Mount Dubois
Pellisier Flats
Mt Hogue
Mountain View and Proctor Mine
Falls Canyon
Queen Dicks Canyon
Middle Fork
North Fork
South Fork
ESMERALDA CO
MONO CO
Black Mountain
Chiatovich Flats
Cabin Creek
Indian Creek
Rock Creek
Pellisier Creek
Mid Creek
Dicks Creek
Spring
Springs
JEEP TRAIL
TRAIL
R33E
R34E
T12S
T13S

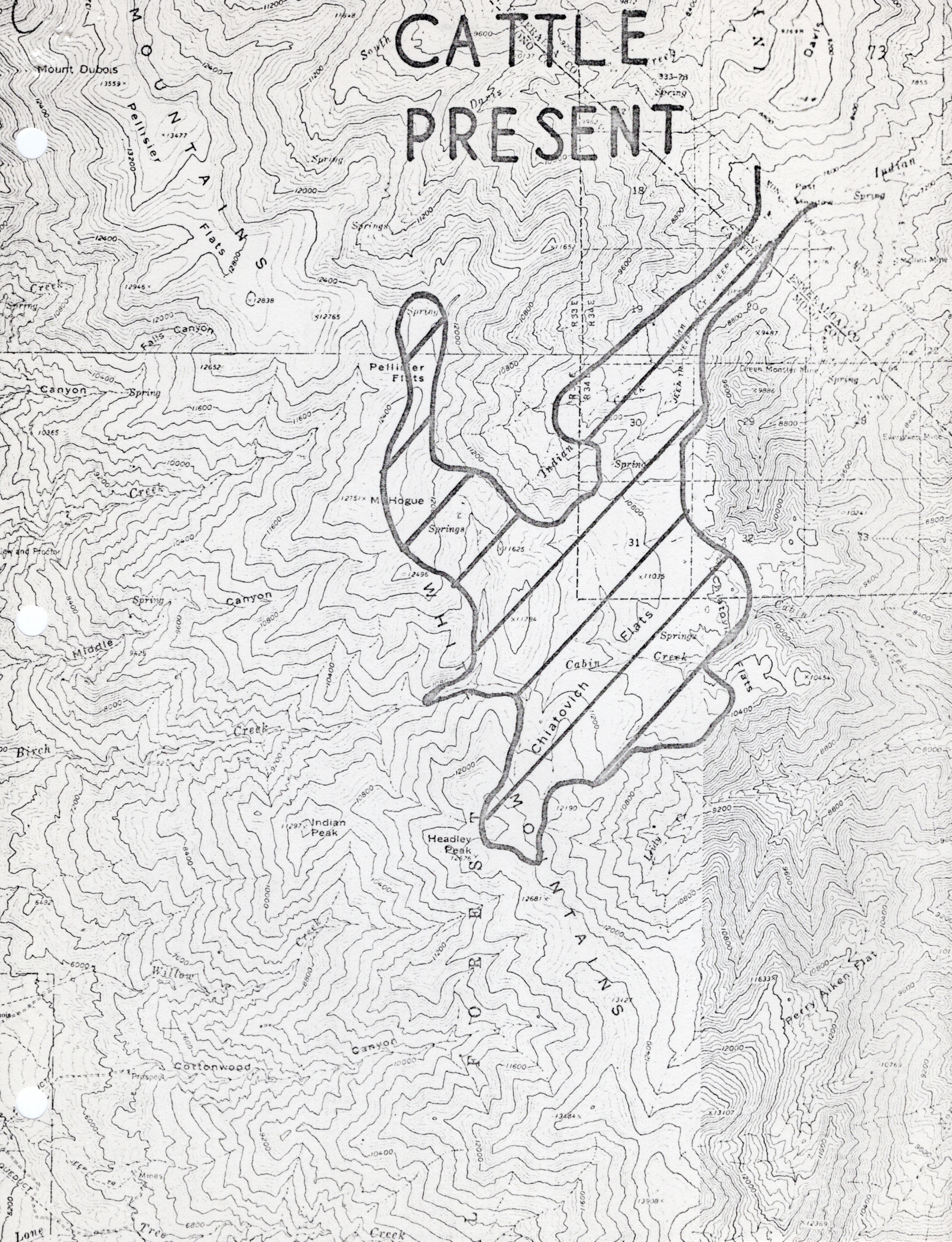
BIGHORN
FUTURE
Peak
Headley Peak
Creek
Willow
Devereaux Ranch
Cottonwood
Canyon
Prospect
Flume
AQUEDUCT
Mines
JEEP TR
Lone Tree
Creek
Hill Ranch
White Mtn Peak
White Mountain Research Sta
Summit Laboratory
(University of California)
Jeffrey Mine
Canyon
Springs
Spring
Milner
Creek
Falls
Copper Queen Mine
Sabies
Canyon
UNKNOWN
Mt Barcroft
Gravel Pit
BOUNDARY
Straight
Canyon
Springs
Canyon
Spring
T4S
T5S


HORSE
PRESENT
FUTURE
Kennedy Flats
Horseshoe Rock Mine
Kennedy Point
Buffalo Point
Canyon
Creek
Trail
Springs
Spring
Boundary Peak
Montgomery Peak
NATIONAL FOREST
Middle
Black Mountain
Chiatovich
North
South
Mount Dubois
Pellisier
Flats
SMERALDA MONO CO
Indian
Creek
Mine
Jeep
Pipeline
Aqueduct
Queen
Mustang Mountain
Buffalo
Orchard Spring
Albert Mine
Garnet Mine
Queen Mine
B & B Mine
T15
R33E
R34E


BURRO
PRESENT
FUTURE
Seep Hole Spring
Johnson Spring
Barrel Springs
Bonanza Gulch
Water Canyon
Paiute Canyon
Paiute Monument
Lead Gulch
Whites Gap Mine
Willow Springs Canyon
Vaughn Gulch
Alhambra Mine
Black Eagle Mine
Bee Springs
Bee Springs Canyon
Betty Jumbo Mine
Squires Tunnel
Shaft
Addie Spring
Lead Canyon
Willow Creek
South Fork
APPROXIMATE
BOY
70
17

BURRO
PRESENT
FUTURE
Andrews Mtn
VABM 11460
Squaw Flat
Squaw Peak
Waucoba Mtn
VABM 12123
Waucoba Canyon
Mt Inyo
Tamarack Canyon
Side Hill Spring
The Narrows
Whippoorwill
Wheeler
Mine


CATTLE
PRESENT
Kennedy Point
Trail Spring
Canyon
Trail
Creek
Mine
Trail
Dry
Creek
Spring
Red Rock Mine
Middle
Creek
Spring
Black Mountain
Chalfant
Ruins
Creek
Davis Mountain
Davis Mine
Indian
Creek
Post
Meadow
Spring
Pellisfer Flats
Green Monster Mine
Marble
Spring
Creek
Middle
Springs
Springs
Springs
Springs
Springs
Springs
Spring
Spring
Spring


CATTLE
PRESENT
Mount Dubois
Pellisier Flats
Falls Canyon
Indian Spring
Mt Hague
Middle Canyon
Birch Creek
Indian Peak
Headley Peak
Willow Creek
Cottonwood Canyon
Chiatovich Flats
Cabin Spring
Perry Aiken Flat
Green Monster Mine
Lone Tree
Mines
Prospect
R 33 E
R 34 E
T 30 N
T 29 N

CATTLE
PRESENT
Stone Corral
Observatory
McAfee Meadow
Springs
South
Spring
White Mtn Research Sta
Barcroft Laboratory
(Univ of Calif)
Barcroft
Cottonwood
Springs
Tres Piedras
Tres Piedras Creek
Tres Piedras Flat
Tres Piedras Meadow
Eva Belle Mine
Cottonwood Creek
Cottonwood Basin
Granite Meadow
Lamb Camp
Spring
Plute Mountain
Sheep Mtn
Patriarch Tree
Cottonwood
McCloud Camp
South Fork
Spring
Station Peak
Deep Spring Dam Camp
ANCIENT
BRISTLECONE PINE
FOREST
AREA
Poison Creek
Spring
Campito Meadow
Golden Siren
White Mtn Research Sta
Crooked Creek Laboratory
Naval Research Station
Campito Mtn
North Fk Crooked Creek
Big Prospector Meadow
Sage Hen Flat
North Fk
South Fk
Bucks Peak
Red Peak
Coldwater Canyon
Springs
County Line Hill
Prospect
Blanco Mtn
MONO CO
INYO CO
Water Canyon
Mill Springs
Canyon
Creek

APPENDIX III

Recommendations to the U.S.D.A. Forest Service Inyo National Forest

A. Habitat Management

1. Designation of Pellesier Flats as a Zoological Preserve. Include the West slope down to 8,000 feet and east slope down to 11,000 feet.

2. Closure of Indian Creek Trail to all vehicles. Restrict travel to horse and foot to eliminate degradation of the tundra region of Pellesier and the meadows of Chiatovich Flats.

3. Restrict cattle grazing to eastern Chiatovich Flats.

4. Closure of Cottonwood Creek Road(east side of White Mtns.) and roads in Tres Plumas Meadow and Flat for integrity of the range and enhancement of the resident wild horse population.

5. Designation of Trail Canyon as a wild horse preserve with public interpretation for public enjoyment of the wild horse population.

6. Remove all horses from the South Fork of Middle Creek, both Forks of Chiatovich Creek, all of Pellesier Flats, and Davis Creek. Removal would require use of helicopter and M-99, and the animals could be transplanted by military helicopter to the Glass Mountain Range or the open range of Nevada, where there are resident herds. The few horses on Pellesier Flats must be removed immediately.

7. Provide public interpretation for the feral burros of Saline Valley to bring a better public awareness of the burro and the situation it brings to the North American deserts. Cooperation with the BLM is necessary for this to be implemented.

8. Remove all burros from Willow Creek and all tributaries of Paiute Canyon. Implement the use of wrangling by permit for the private collection of the animals. This will require cooperation with the BLM. The California Department of Fish & Game files can be consulted for the manes of wranglers who were issued permits prior to 1971 restrictions. These people should be contacted and encouraged to participate in this management program for the good of the burro and the range. Public envolvement in this management is desirgble.

9. Maintain water flow and acces for all water sources in the Inyo Mountains for utilization by bighorn sheep and all other wildlife in the critical summer months. Brush need by removed in several areas for better access. This is the case in Falling Rocks and Paiute Canyons.

10. Deny all commercial large scale mining exploration and exploitation requests for the western slope of the White Mountains and any range found to be bighorn habitat in the Inyo Mountains. Allow small scale prospecting in cases where usurpation of the water supply is not practiced. Any small scale operations must be more than one-half mile from the nearest water used by bighorn sheep.

B. Bighorn Management

1. Fund a complete sudy of the ecology of the bighorn sheep in the White Mountains and the Inyo Mountains within the Forest, and outside its boundaries.
2. Provide for a minimum study time of six months.
3. Hire two wildlife biologists for the entire survey.
4. Study April and May in the Inyo Range, June, July, and August in the White Mountains, and in September finish the Inyo Mountains.
5. Study every canyon of the west slope of the White Mountains, Boundary Peak, Montgomery Peak, and upper areas of Mount Barcroft, White Mountain Peak, and Sheep Mountain.
6. Study all canyons of the Inyo Range.
7. Survey all water sources in both ranges and determine suitability of ranges to bighorn sheep.
8. Study should determine present population numbers, densities, range, distributions, and dynamics. Also, food habits, reproduction, human caused disturbances, determine disease through necropsies, and analize scat samples for parasitic involvement.
9. Factors of competition with wild horses, feral burros, deer, and cattle could be more completely exposed and better dealt with by the Forest Service.
10. Collection of skulls from the range be used for determination of subspecific designation.
11. Recommendations from this proposed study be implemented by the Forest Service to protect this valuable, but dwindling resource.

APPENDIX IV

Hansen Habitat Analysis for Qualiftatively Evaluating Desert Bighorn Habitat

System Originated by the late Dr. Charles G. Hansen.

"The prupose of this system is to qualitatively evaluate lands...for desert bighorn sheep(Ovis canadensis nelsoni) using environmental characteristics and value for man's use. I addition to evaluating land, the method points out local factors limiting bighorn use. The rating system is based on a numerical score. The score is obtained by adding together points or numerical values assigned to the various components of the habitat.

The habitat is rated as: a) Not important to bighorns, or of high value for human use; b) Buffer zone or zone of deficiency for bighorns, or area of potential economic value or of moderate human use; c) Periodic use or zone of deficiency for bighorns, or area of potential economic value or of occasional human use; d) Important to bighorn sheep; and e) Vital to bighorn sheep.

The components of habitat used are:

1) Natural Topography
2) Vegetation Type
3) Precipitation
4) Evaporation
5) Water, type and use
6) Bighorn Sheep use
7) Human use

The analysis of the study area is found on the following page.

Hansen Habitat Analysis for Survey Area

area	score	suitability to bighorn
White Mountains		
Trail Cyn. to Leidy Ck.	52	Buffer zone or zone of deficiency
Montgomery Pk. to Boundary Pk.	92	Vital to bighorn
Montgomery Ck. to Queen Dicks Cyn.	100	Vital to bighorn
Rock Creek to Middle Ck.	100	Vital to bighorn
Birch Creek	70	Important to bighorn
Willow Ck to Milner Ck.	100	Vital to bighorn
Pellesier Flats	67	Periodic use or zone of deficiency
White Mtn. Pk. to Mt. Barcroft	95	Vital to bighorn
Tres Plumas Flat and Cottonwood Creek	64	Periodic use or zone of deficiency
Inyo Mountains		
Marble Canyon to Waucoba Mountain	45	Buffer zone or zone of deficiency
Waucoba Cyn. to Lead Cyn.	78	Important to bighorn
Upper Paiute Cyn.(above 5,200 feet)	108	Vital to bighorn
Lower Paiute Cyn.(below 5,200 feet)	69	Periodic use or zone of deficiency
Willow Creek	63	Periodic use or zone of deficiency
Pat Keyes Cyn. to New York Butte	87	Important to bighorn

Explanations of the analysis is found on the following page.

Hansen Habitat Analysis-----Explanations for the White Mountain Range

Trail Canyon to Leidy Creek — Buffer Zone or zone of deficiency 52
Presence of wild horses, dense conifers in areas, historic timbering in Cabin Creek and Indian Creek, cattle grazing in all canyons involved.

Montgomery Pk. to Boundary Peak — Vital to Bighorn 92
Absence of exotic herbivores, non-use by humans, steep terrain, lack of optical obstructions, presence of scattered grasses.

Montgomery Ck. to Queen Dicks Cyn — Vital to bighorn 100
Absence of exotic herbivores, non-use by humans, steep terrain, old fire scar in Marble Creek, providing good grasses, minimul obstructions to sight, sufficient water supply.

Rock Creek to Middle Ck. — Vital to bighorn 100
Absence of exotic herbivores, non-use by humans, steep terrain, good grasses, important wintering area, sufficient water, minimal obstructions to sight.

Birch Creek — Important to bighorn 70
Used less frequently by bighorn than surrounding canyons, because of cattle grazing in upper canyon, causing moderate impact. Good water and terrain.

Willow Ck. to Milner Ck. — Vital to bighorn 100
Absence of exotic herbivores, non-use by humans, steep terrain, good grasses and water, important known wintering range in Willow and Lone Tree Canyons.

Pellesier Flats — Periodic use or zone of deficiency 67
Presence of wild horses throughout, cattle on the southern end, lack of good escape terrain, use by hikers and deer hunters, presence of three OHV's in Fall by hunters, infrequent landing of aircraft on makeshift airstrip, but has good water and forage.

White Mtn Pk. to Mt. Barcroft — Vital to bighorn 95
Steep terrain, known summer range, lack of exotic herbivores, scattered grasses, but has road and facilities.

Tres Plumas and Cottonwood Ck. — Presence of wild horses, heavy cattle use, roads, deer hunters, sage grouse hunters, but has good terrain, sufficient water, and abundant grasses.

Hansen Habitat Analysis----Explanations for the Inyo Mountain Range

Marble Cyn to Waucoba Mtn — Buffer zone or zone of deficiency 45
Lack of water, heavy growth of conifers, intermittent cattle grazing, some previous mining activity.

Waucoba Cyn to Lead Cyn — Important to bighorn 78
Steep terrain, sufficient water, good grasses in upper canyons, poor grasses in lower areas due to heavy use by feral burros, use in lower Lead Canyon by prospectors, presence of cabins, heavy deer population in Waucoba Canyon.

Upper Paiute Canyon — Vital to bighorn 108
Absence of exotic herbivores, low deer numbers, steep terrain, excellent grasses and water, non-use by humans, good protection in side canyons, major bighorn feeding and watering area.

Lower Paiute Canyon — Periodic use or zone of deficiency 69
Contrasted to upper canyon. Heavy burro use, grasses depleted, other vegetation damage, good terrain and sufficient water, minimal obstructions to sight, non-use by humans.

Willow Creek — Periodic use or zone of deficiency 63
Moderate burro use, grasses depleted, good terrain, sufficient water, minimal obstruction to sight, but presence of structures, roads, and mining activity.

Pat Keyes Cyn to New York Butte — Important to bighorn 87
Lack of human use, lack of exotic herbivores, steep terrain, good grasses, sufficient water, but history of mining pressure with use of sheep as food source, numbers scattered and low.

APPENDIX V

Public Law 92-195
92nd Congress, S. 1116
December 15, 1971

To require the protection, management, and control of wild free-roaming horses and burros on public lands.

Sec.1.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Congress finds and declares that wild free-roaming horses and burros are living symbols of the historic and pioneer spirit of the West; that they contribute to the diversity of life forms within the Nation and enrich the lives of the American people; and that these horses and burros are fast disappearing from the American scene. It is the policy of Congress that wild free-roaming horses and burros shall be protected from capture, branding, harassment, or death; and to accomplish this they are to considered in the area where presently found, as an integral part of the natural system of the public lands.

Sec. 2.

(a) All wild free-roaming horses and burros are hereby declared to be under the jurisdiction of the Secretary for the purpose of management and protection in accordance with the provisions of this Act. The Secretary is authorized and directed to protect and manage wild free-roaming horses and burros as components of the public lands, and he may designate and maintain specific ranges on public lands as sanctuaries for their protection and preservation, where the Secretary after consultation with the wildlife agency of the State wherein any such range is proposed and with the Advisory Board established in section 7 of this Act deems such action desirable. The manner that is designed to achieve and maintain a thriving natural ecological balance on the public lands. He shall consider the recommendations of qualified scientists in the field of biology and ecology, some of whom shall be independent of both Federal and State agencies and may include members of the Advisory Board established in section 7 of this Act. All management activities shall be at the minimal feasible level and shall be carried out in consultation with the wildlife agency of the State wherein such lands are located in order to protect the natural ecological balance of all wildlife species which inhabit such lands, particularly endangered wildlife species. Any adjustments in forage allocations on any such lands shall take into consideration the needs of other wildlife species which inhabit such lands.

(b) Where an area is found to be overpopulated, the Secretary, after consulting with the Advisory Board, may order old, sick, or lame animals to be destroyed in the most humane manner possible, and he may cause additional excess wild free-roaming horses and burros to be captured and removed for private maintenance under humane conditions and care.

(c) The Secretary may order wild free-roaming horses or burros to be destroyed in the most humane manner possible when he deems such action to an act of mercy or when in his judgement such action is necessary to preserve and maintain the habitat in a suitable condition for continued use. No wild free-roaming horse or burro shall be ordered to be destroyed because of overpopulation unless in the judgement of the Secretary such action is the only practical way to remove excess animals from the area.

Sec. 10.

The Secretary of the Interior and the Secretary of Agriculture shall consult with respect to the implementation and enforcement of this Act and to the maximum feasible extent coordinate the activities of their respective departments and in the implementation and enforcement of this Act. The Secretaries are authorized and directed to undertake those studies of the habits of wild free-roaming horses and burros that they may deem necessary in order to carry out the provisions of this Act.

Approved December 15, 1971.

APPENDIX VI

Water Sources Visited During Survey
(north to south)

1. Trail Canyon--running stream use: horse, cattle, deer, chukar, coyote, hawks, eagles, small birds and mammals.
2. South Fork Trail Canyon--found no water at upper spring site. use: horse and cattle use, heavy.
3. Northwest Fork Dry Creek--small spring, app. 2-3 qts/min. clean. use: heavy by horses, no scat in spring, grass cropped by horses, deer sign.
4. Dry Creek--9,000 feet, running stream, 5-7 gal/min use: horse, old cattle sign, deer.
5. Middle Creek--running stream, more than 20 gal/min has three tributaries which flow into it. use: horse below 8,400 ft., cattle to 9,300 feet, deer in entire canyon, but weak where cattle sign is heavy(8,700 to 9,000 feet).
6. Middle Fork of Middle Creek--spring, 10,000 feet, southern of two marked as "springs" on topo. flow is 3 qts/min. use: deer, birds, water flows for 150 yards.
7. South Fork Middle Creek--seep, 11,020 feet,near small playa, use: horse(heavy), deer, chukar. Not flowing but moist, prob. flows in Spring.
8. Chiatovich Creek--running stream, more than 100 gal/min use: cattle, deer, horses above 9,100 feet, coyote, birds.
9. Lower South Fork Chiatovich Springs--9,150 feet, running stream, app 100 gal/min use:horse, deer, old cattle sign.
10. Upper South Fork Chiatovich Spring--11,450 feet, running stream, app 25 gal/min use:horse, deer, chukar.
11. Sheepherder Spring--100 yds. SE of Mt 13,477. 13,300 feet, running stream app 10 gal/min use: horse,deer,historic bighorn, coyote, eagles.
12. Upper Davis Creek Spring--3-5 gal/min 11,200 feet use: coyote, light deer, birds.
13. Upper Queen Dicks Springs--Pellesier Flats 13,200 feet small seep use: deer, light horse use, marmots,pika, birds.
14. Falls Canyon--running stream 10,500 to 6,400 feet. use:bighorn, deer, chukar; flow of 200-300 gal/min
15. Indian Creek--running stream, 75 gal/min use: horse, cattle,deer, chukar, coyote.
16. South Fork Indian Spring--9,700 feet. on old wagon road to Chiatovich Flats, use:heavy cattle use, deer.
17. Chiatovich-Cabin Creek Cattle Trough--trough empty, flow is static in sunken pipe. use: sage grouse, deer, cattle(heavy seasonally).
18. Cabin Creek--running stream, use:deer,cattle,sage grouse, small birds, rabbits.
19. Northeast Chiatovich Flats Springs--headwaters of North Fork Birch Creek,11,750 feet. use: cattle(heavy), deer, coyote, eagles.
20. Birch Creek--both forks. running stream, 100 gal/min use:cattle(heavy), deer, eagles, coyote.
21. South Fork McAfee Spring--11,200' use:deer, horse(light),cattle(light).
22. Upper Cottonwood Creek Spring--11,050' 8-10 gal/min use:cattle(mod),deer, coyote.
23. Cottonwood Creek Spring--10,300 feet 10 gal/min. use: horse,cattle,deer,coyote.

24. Tres Plumas Creek-- 10,300' Tres Plumas Meadow, use:horse(heavy),cattle (heavy), deer.
25. Waucoba Spring--tank,storage of 40 gals. 5,900' use:burro(heavy), deer, coyote, human, rabbit, birds.
26. Waucoba Canyon Spring--6,700' 20 gal/min use:burro(heavy), deer(heavy), coyote.
27. Lead Canyon--horizontal pipe spring 6,000 feet at prospectors cabin site. use:burro(moderate), deer, coyote, rabbits.
28. Falling Rocks Canyon-Upper Spring--6,400 feet small stream flows for app 1 mi. use:bighorn, coyote, birds.
29. Lower Falling Rocks Canyon Spring--5,200 feet flows into main fork of Paiute Canyon. use:burro(heavy), coyote, birds.
30. Lower Paiute Canyon Springs--3,400' two springs in willow thickets. use:burro (heavy),coyote.
31. South Fork BeveridgeCanyon Spring--8,800' use:bighorn, deer, coyote, birds.
32. Beveridge Creek--running stream, begins at 6,600' use:deer, historic bighorn, three domestic burro owned by prospector, birds.
33. Saline Valley Salt Lake--1,070' use: burro coyote, waterfowl,small birds, rabbits, fox.

APPENDIX VII

Birds Sighted in the White Mountains

Clarks Nutcracker--Trail Canyon, Dry Creek, Falls Canyon, Middle and Chiatovich Creeks above 8,000'.
Rufous Crowned Sparrow--Pellesier Flats to 12,600'.
Chukar--Falls Canyon, Trail Canyon, head of Queen Dicks, Middle and Chiatovich.
Golden Eagle--Falls, Trail, Dry, Middle, Chiatovich, Indian, Davis, Pellesier Flats, Marble Canyon.
Red-Tailed Hawk--Dry Canyon, Middle Creek.
Green Tailed Towhee--Falls Canyon, 6,000'
Rufous Sided Towhee--Falls Canyon, 6,000'
Dipper--Falls Canyon, 6,000' to 8,800'.
Canon Wren--Falls Canyon, 7,000'and above.
Raven--Falls Canyon, 5,000' to 8,800'.
White Throated Swift--Falls Canyon, 5,000' to 9,000'
Mountain Chickadee--in pinon pines, Falls Canyon, Dry Creek, 9,300'
Stellers Jay--Falls Canyon, Trail Canyon, Chiatovich Creek 8,000' to 10,000'
Scrub Jay--Chiatovich Creek, 7,000'
Mountain Blue Bird--Dry Creek, Middle Creek Ridge, 10,700'
American Kestrel--Trail Canyon,9,000'
Red Shafted Flicker--Falls and Trail Canyons, 8,000' to 9,000'
Blue Grouse--Middle Creek, 10,000'
Oregon Junco--Middle Creek 10,000'
Gray Headed Junco--Pellesier Flats, 12,400'
Meadowlark--Pellesier Flats,12,600'
Sage Grouse--Chiatovich Flats,10,800'